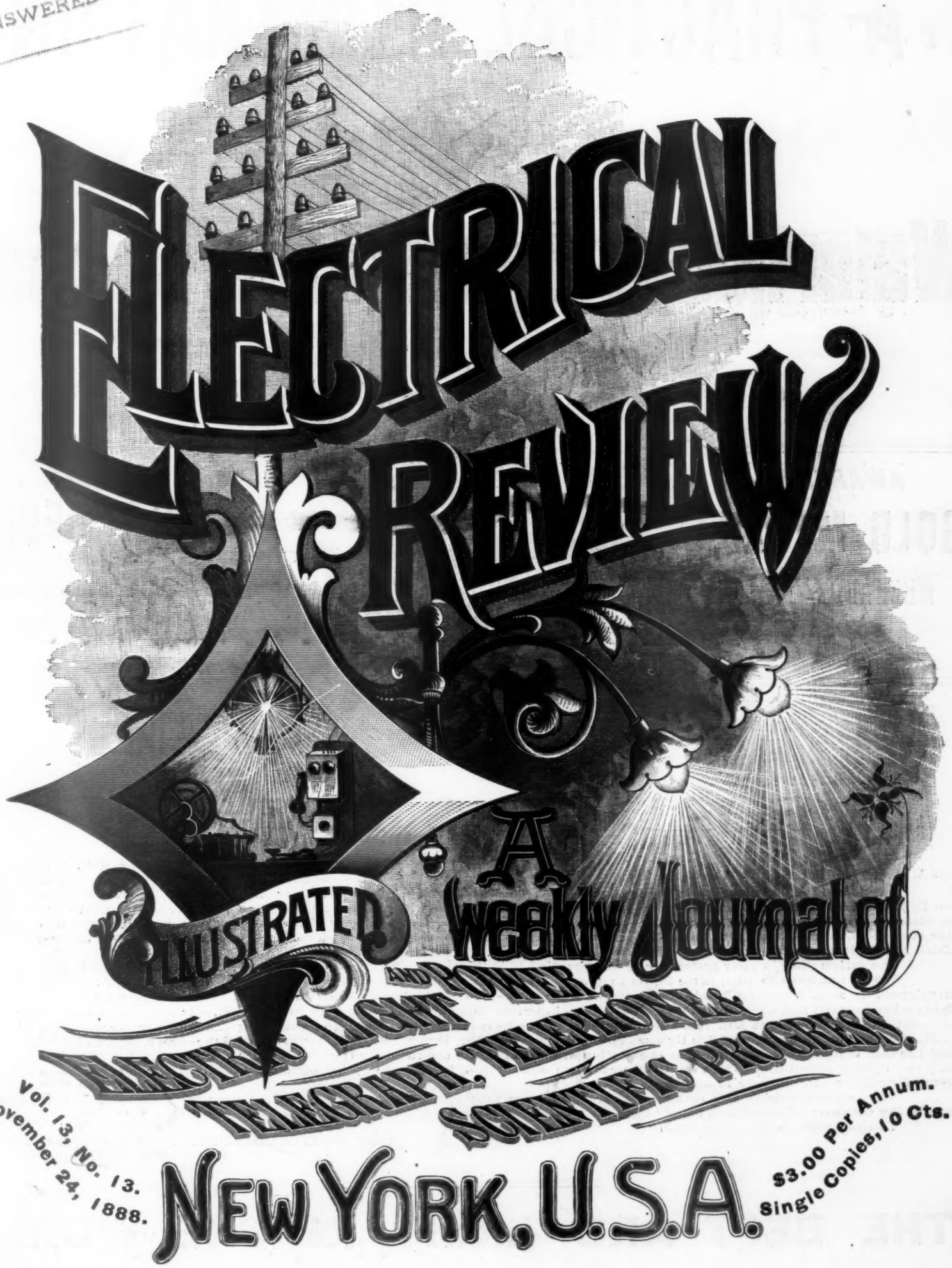
RECEIVED
NOV 28 1888
ANSWERED.

SUPT.



Vol. 13, No. 13.
November 24, 1888.

NEW YORK, U.S.A.

$3.00 Per Annum.
Single Copies, 10 Cts.

A PRACTICAL ILLUSTRATION

OF THE

Waterhouse System OF Arc Lighting

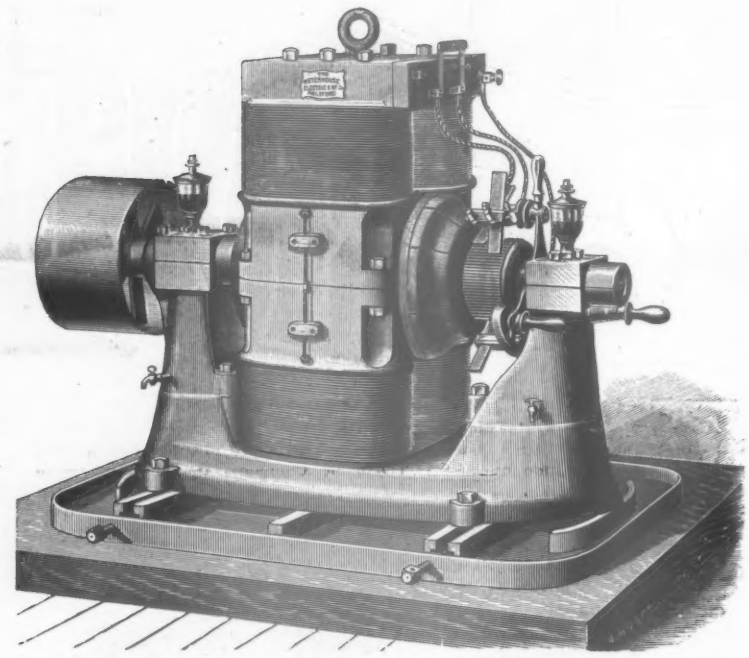
AWARDED:

GOLD MEDAL,

MECHANICS' FAIR,

BOSTON.

DECEMBER, 1887.



AWARDED:

GOLD MEDAL,

—AND—

Two Silver Medals,

CENTENNIAL EXPOSITION,

Cincinnati, October, 1888.

READ THIS LETTER.

Hartford, Conn., Oct. 15, 1888.

The Waterhouse Electric and Manufacturing Co.

Gentlemen: In reply to your inquiry would say, on last March we purchased our first dynamo (35 lighter), and having five arc lights ordered, that number were placed on the line. The dynamo was running at that time 100 revolutions above speed but the regulator maintained the standard current and the machine was perfectly cool, very little current passing around the field magnets. Our customers were pleased with the lights and many have stated to us that they would not change for those of the old company, which the Waterhouse displaced.

The satisfaction in your system to those operating it is this:

We do not have to burn more lights than are actually required. As an example, on the 35 light circuit of the machine above mentioned, we start when the inside lights are wanted; the store outside lights being turned off. Our trimmer turns on the outside lights when wanted and the full number burn. At intervals during the evening, up to 10 P. M., our customers close their stores, turn out their inside lights and leave their outside lights burning to illuminate the windows; and on the circuit from 10 to 12 P. M., we have on an average of five lights, the balance having been turned off. This has been done every night since last March, and the fact is that we do not know at the station when the lights are turned off, because there is no over production of current. If only one light was required to run on that circuit we should not hesitate to operate it on the 35 light dynamo, because the Waterhouse Regulator will regulate to one light.

The representations you make of your system are fully carried out in practice, not only in the matter of regulation but also in the economy of power and steady light.

You can refer to us at any time. Yours truly,

THE HARTFORD LIGHT AND POWER CO.,
David Henney, President.

THE BEST ARC LIGHT IN THE WORLD

IS MANUFACTURED BY

The Waterhouse Electric & Mfg. Co., Hartford, Conn.

SEND FOR CATALOGUE.

ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 13, No. 13. WEEKLY. | NEW YORK, SATURDAY, NOVEMBER 24, 1888. | $3 per annum. Single Copies, 10 Cents.

Copyright, 1888, by ELECTRICAL REVIEW PUBLISHING COMPANY, 13 Park Row, New York.

Entered at Post Office, New York, as Mail Matter of the Second Class.

Electric Targets.

Constantly recurring accidents at target practice, as well as the uncertainty of the marker's indications, have at various times been the subject of more or less perfect devices for the accomplishment of the desired end with less attendant danger, and at the same time greater exactness.

One of these inventions was recently described by a French military journal, which depends upon the use of an electric current for effectiveness.

At five different points back of the target are placed small open keys consisting of vibrating springs in front of a plate of iron covered with bristling points, a small space separating the contact between the points and the key. The circuits starting from the keys run to an annunciator with five drops, at the firing bench, thence to battery and ground. From the plate behind the target direct to ground. Now, when a ball strikes within the space covered by one of the little vibrating springs it makes contact with the bristling points on the plate back of the target, closes the circuit and drops its proper shutter at the firing bench.

It really does seem as if this is not entirely new, but it is just as good for all that; and the use of it at Highwood, near Chicago, a few weeks ago would have saved a little boy's life, which he lost while marking. Fortunately it was not known who fired the fatal shot. As the lad failed to appear after several shots had been fired, search was made, and he was found behind the target, shot dead!

A New Electric Semaphore.

The Gould-Tisdale Revolving Semaphore Company, of Pearl street, Boston, has just perfected and put on the market a new electric signal for station semaphore and block systems for railways. Like other semaphore systems, this displays a bright bull's-eye lens at night, showing white for safety and red for danger, and a form signal by day, but it has the advantage that its operation involves no mechanical work, everything being accomplished by electric current and the operation of gravity. The mechanism of the system itself consists of a cylinder notched at both ends to receive two steel-pointed catches, one of which is attached to the armature of a powerful electric magnet. Upon closing the circuit this armature is raised, thus freeing the steel point and allowing the cylinder and connected signal to make a quarter revolution, power being given by a suspended weight. Upon the circuit being interrupted or broken, the armature falls by gravity, permitting another quarter turn of the cylinder and arm, the natural position of the arm, or its position at rest, showing danger. The weight may be wound up nightly at the time of lighting the lamp, by turning the arm around in the opposite direction from that in which it automatically rotates. Among the accessory advantages claimed under this system, is the fact that the position of the signal is announced to the operator by bell and by indicator, when it is set at safety; when it falls to danger; while it is being wound; if moved by any person other than the operator; if for any reason it fails to work correctly. After the signal has been set in either position and the fact announced by bell, it will prove its correctness by setting the indicator last. An important point of difference between this and other systems is the fact that no circuit too weak or faint to set the semaphore, can, by any possibility, ring the bell or set the small indicator. These conditions demonstrate to the operator the position of his signal, though such signal

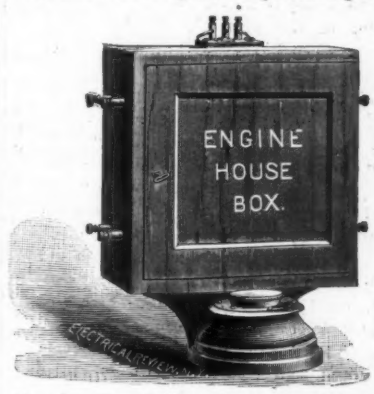


FIG. 1.—THE AUXILIARY FIRE ALARM SYSTEM.—BOX CLOSED.

may be out of sight, and even miles away, and as the simple shifting of a small electric key will change the signal, be it near at hand or at a distance, one station may afford

FIG. 2.—ENLARGED VIEW OF BOX, SHOWING INTERIOR.

shelter for the operator of a long section of track signal. The block system application is made as in other systems and works perfectly. Current is supplied by a gravity battery, and the circuit is metallic. The signal system can be connected with switches on the line, a misplaced switch or car on a siding, too near the main line, showing the danger signal automatically. Very complete models in practical working size, are shown at the company's offices, and the system, with its new improvements, is already being put in use on many roads in New England and the west.

Write to Mr. S. S. Leonard, Minneapolis, Minn.

TO THE EDITOR OF ELECTRICAL REVIEW:

Will you kindly let me know where I can get some information on the subject of heating steam boilers with fuel oil?

Waterford, Ont. W. C. PALMER.

The U. S. Illuminating Company Enjoins the Board of Control.

Upon the application of the United States Illuminating Company, of this city, Judge Lawrence has granted an injunction restraining Jacob Hess and the other members of the Board of Electrical Control from interfering with or removing any of the company's poles, wires, or fixtures until such time as the Board shall have provided a proper and sufficient substitute under the surface of the streets for the overhead system, so that the company can maintain and operate its electrical conductors beneath the surface of the streets, and thus carry on its business without interruption. The injunction also prevents the Board from doing any acts tending to give the Metropolitan Telephone Company, the Western Union Telegraph Company, and the East River Electric Lighting Company any other or greater facilities or privileges than shall be granted to the Illuminating Company.

The Electric Shell.

Experiments, carried out with great secrecy, but reported to have given very satisfactory results, are being made at Kiel with the new electric shell, thrown from the Zalinski pneumatic gun. This shell, which is of gun metal, ¼ inch thick, and made in one piece, is six feet eight inches long, and weighs about 220 pounds. It carries a charge of 600 pounds of blasting gelatine. This formidable missle is constructed to explode either from the shock of striking against a resisting body, or from the heating effects of an electric current after two seconds of immersion in the water. The shell contains the elements of a chloride of silver battery, to which the necessary water is admitted on the shell sinking. Thus, if the shell strikes the ship but lightly, or drop a little short of its mark, it will explode beneath the surface of the water two seconds later. It is expected to be useful in blowing up an enemy's fixed torpedoes.

The Gardiner Auxiliary Fire Alarm System.

We illustrate this week the Gardiner Auxiliary Fire Alarm System, a recent invention, and one which promises to make a revolution in fire alarm signalling.

The most valuable feature, and the one which distinguishes this from all other auxiliary systems, is that each Gardiner auxiliary box designates, when pulled, its particular number in the nearest fire engine house, so that five seconds after the discovery of a fire, the firemen know exactly where it is.

It is difficult to imagine anything lacking in a system which gives such results, but when in addition we find that these results are attained without the use of any complicated or expensive apparatus, it would appear to answer every requirement.

Among its special advantages, besides the designating signal, which alone would insure the success of the system, are the following:

1. It is operated by a single line on a closed metallic circuit, and wired in the ordinary manner.

2. An automatic return signal that the fire department has received the alarm, is given by a bell ringing in the auxiliary box.

3. Only a light current is used for the closed circuit in constant use, the additional current required coming into circuit only when an alarm is given, so that battery expense is at a minimum.

4. The operation of the street box in the ordinary manner is not interfered with, though it is set in motion precisely the same as if pulled by hand, immediately after the auxiliary signal is given in the fire engine house.

5. A disturbance bell shows any trouble in the line or battery, and perfect protection is given against false alarms.

6. The whole system is such that an ordinary lineman can set it up, and any person of ordinary intelligence can take care of it.

As each of the Gardiner boxes sends in its own distinct designating number to the fire department, it follows that besides its value as an auxiliary, it is a complete fire alarm system in itself, entirely independent of others, and owing to its low cost, we look for its immediate adoption by numbers of cities which have hitherto been financially unable to provide themselves with that necessity, a first-class fire alarm system.

Wherever this system is adopted it will at once become one of the most valuable aids to the prompt extinguishment of fires and will receive a cordial welcome from the firemen, who can appreciate more than any other class, the advantage of getting to a

fire five minutes after its discovery, instead of twenty or thirty as is generally the case now.

The system is now in actual operation in the city of Newark, N. J., working as smoothly and effectively as though it had been in use for years.

The Gardiner Auxiliary Fire Alarm Company have their office in Room 51, Stewart Building, 280 Broadway, New York, where their systems, both auxiliary and direct, can be seen in operation. The REVIEW is pleased to call attention to the work of this company, and commend the enterprise shown in bringing this valuable improvement in fire protection to public notice.

An Editor's Variegated Ink.

A Boston publisher remarked the other day upon a whimsical peculiarity of Eugene Field, the Chicago humorist, which offers large possibilities to the compounder of humorous paragraphs. Mr. Field keeps upon his desk an assortment of bottles containing ink of different hues, each provided with its particular pen, and it is his whim to change from one to another whenever his tricksy spirit moves him, so that the general appearance of his completed manuscripts is strongly suggestive of Joseph's coat of many colors. The possibility of adapting the color of one's ink to the sentiments flowing from his pen, of inditing a pessimistic sentiment in indigo, a sarcastic gibe in virulent green, a Nihilistic paragraph in the red sacred to anarchy, and so on through the list of shades, might, on the whole, have an inspiring effect upon writers susceptible to outward conditions. "I publish the idea," says Mr. Arlo Bates in the *Book Buyer*, "for the benefit of all struggling members of the guild of letters, and I trust Mr. Field will not regard me as an enemy who has basely betrayed the secret of his success."

The Advance in Telegraphy.

In the paper on the "Inception of Electrical Science and the Evolution of Telegraphy," read by Mr. F. N. Gisborne, F. R. S. C., Superintendent of Government Telegraphs, at the last meeting of the Canadian Society of Civil Engineers in Montreal, some of the conclusions drawn by the author are as follows:

That timber poles, preferably of cedar, duly provided with lightning conductors at every fifth or tenth pole, are best adapted for telegraph lines throughout Canada, excepting through prairie lands subject to fires, where iron posts are desirable.

That No. 6 galvanized iron wire, per specification hereinbefore cited, is preferable to copper or composite wires for aerial lines of considerable length, and in exposed localities.

That porcelain insulators are the most economical and efficient, under similar condition.

That gravity batteries are the most reliable for closed circuits, and Gassner's dry cells for open circuits.

That in towns and populous districts all electric wires, gas and water pipes, should be placed in traversable underground conduits, or the wires in sidewalk troughs.

That the Morse and Vail system, with sounding apparatus operated by dot and dash signals, is the most effective in the hands of skilled operators, for general purposes.

That the Wheatstone automatic transmitter, by a paper tape or strip previously perforated with dot and dash, or all dot lettering drawn rapidly between contact makers, and reproduced mechanically upon plain, or chemically upon prepared receiving paper at the possible rate of 1,000, and practical rate of 400 or 500 words per minute, is the best combination for the rapid transmission of intelligence.

That the most successful and profitable telegraph companies of the future will abandon the present system of a multiplicity of wires for the transmission of intelligence; and at business centers and important stations will employ female labor for perforating and comparing with the original manuscript, despatches to be forwarded by automatic transmitters; an additional wire or two being operated by Morse sounders for the correction, when needed, of automatically transmitted messages, and also for the requirements of intermediate local business. Such additional wire or wires being available for duplex, quadruplex, or multiplex instruments.

C. H. Summers, the Chicago Electrician, Gives Some Telegraph Reminiscences.

Mr Summers, electrician of the Western Union Telegraph Company, in Chicago, is an old operator. He was an operator before the Western Union was in existence, says the Chicago *Herald*. In 1850 there was a line known as the National line. It was

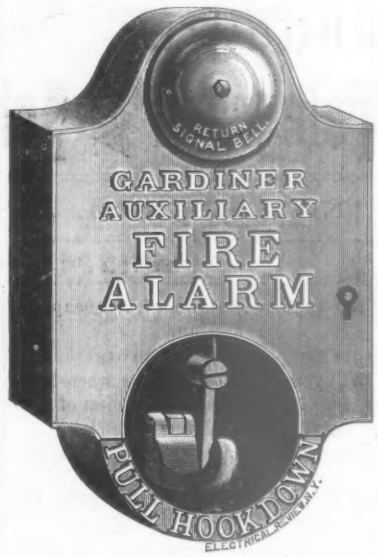


FIG. 3.—THE AUXILIARY BOX.

built along a highway that run from Pittsburgh to Cincinnati and Louisville. The line connected at Pittsburgh with O'Riley's line, which had its headquarters in Philadelphia. It was an individual line, as all of the telegraph lines were in those days. The principal line in New York state was the Wade line, that ran from New York city to Buffalo. Most of the wires were strung on saplings in those days. The principal line in the South was the Speed line. It connected with the National at Louisville and was the only telegraph line in the South.

On one occasion while Summers was stationed at some point between Pittsburgh and Cincinnati, one of the employés named Doran happened in that section with some repairers. Pay-day came and Doran went to Summers and told him he wanted to draw some money to pay off his hands. Summers told him he couldn't draw any money through him. "I know you fellows," he said. "You are not telegraph men, but sharpers." Doran said he was an operator himself and would send a message to the home office asking for what he wanted. Summers told him that if he wanted to write a message that he (Summers) would send it. Doran wrote the message and handed it to Summers, who counted the words and said: "Forty cents." Doran tried to explain that this was the company's business, but Summers was firm and Doran had to come down. Doran is now superintendent of construction of the company in New York city.

"I remember," said Mr. Summers, "when we first began reading by sound. The first man whom I ever saw or heard try it was Jimmy Leonard. It was in an office on the old National line. It was like everything else new—looked upon by the management with suspicion. Leonard soon picked it up, but he didn't dare let the superintendent know it. The superintendent was named Speed, and he had said that reading by sound was all bosh and he didn't want any such nonsense in any of his offices. Leonard was working on this principle all the while, however, when Speed wasn't around. After it became known that such a thing was possible and that it was advisable to adopt it, Speed went to Leonard and asked him if he could do it. Leonard said he couldn't. Speed thought he might learn and give him the benefit of his judgment. Leonard was afraid to learn too quickly, for he was not certain that Speed was not trying to catch him. By degrees he unfolded the secret and finally Speed gave in.

"Leonard was one of the most remarkable operators I ever knew," continued Mr. Summers. "He was the only man I ever knew who could send a message with one hand while, at the same time, he could receive from another line with his other hand. He died down South and not long ago. When the old-time telegraphers met here they raised money and had his remains brought back to Louisville, his old home, and put to rest among his kindred."

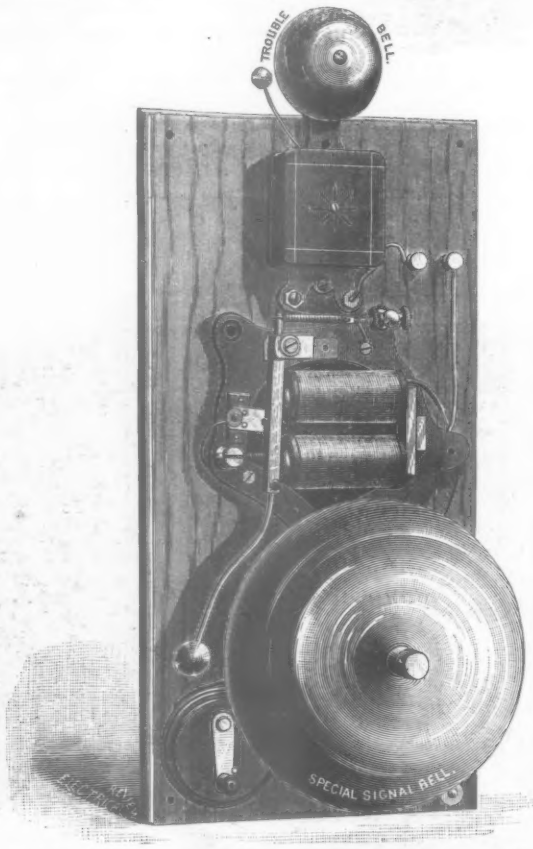


FIG. 4.—GARDINER AUXILIARY FIRE ALARM.—Showing Signal and Trouble Bells.

The Western Union telegraph is not as old as many suppose. It was organized in 1853. Most of the individual lines of the East were absorbed in this organization. When it was known that such a company was being organized several shrewd men in the country bought up some of the wildcat companies for a mere song and held them until their purchase by the Western Union became a necessity and the sharpers thus realized handsome fortunes.

The Western Union has grown, as most of us know. But how much we do not realize. It has now 616,248 miles of wire and 17,241 offices. In the year 1887 it handled 51,463,955 messages.

The Execution of Criminals by Electricity.

A CAREFULLY PREPARED REPORT ON THE BEST METHOD TO PERFORM THIS OPERATION.

At a recent meeting of the Medico-Legal Society a committee was appointed, in view of the new law doing away with hanging in the State of New York, after Jan. 1, to report the best method of putting the law into effect. The committee was composed of Dr. Frederick Peterson, late of the State Insane Asylum, at Poughkeepsie; Dr. J. Mount Bleyer, R. Ogden Doremus and Dr. Frank H. Ingram, formerly assistant superintendent of the Blackwell's Island Insane Asylum.

This committee made its report Wednesday evening, November 14th, to the Society, and we publish it in full with sketches illustrating the plan decided upon.

THE REPORT.

To the President and Members of the Medico-Legal Society:

Your Committee appointed at the September meeting to consider and advise upon the proper method of executing criminals by electricity, reports as follows:

The Law recently passed by the Legislature of the State of New York, providing for the administration of capital punishment by electricity, goes into effect January 1st, 1889. All murderers sentenced to death for crimes committed on or after that date are to die by this means. As the use of electricity is an entirely novel method of putting to death human individuals, the manner of the application of the lethal current requires some thoughtful care and study.

The Commission appointed by the Governor to examine into various methods of causing death, which should be more humane than hanging, decided upon electricity. This Commission caused certain experiments to be carried out upon dogs by which it was proven that electricity will produce certain and instantaneous death. In these experiments the animals were placed in a zinc-lined box half filled with water connected with one pole, while the other pole, in the shape of a wire, was wound around the nose or inserted into the mouth. There are no data as to the amount or kind of electricity employed. This method, although successful, is hardly applicable to a human being.

Some experiments were conducted by one of our Committee (Dr. J. Mount Bleyer), and reported in the *Humboldt Scientific Library*, March, 1887; and during the past summer a series of thirty or more careful experiments were made upon dogs with death currents at the Edison Laboratory in New Jersey by Messrs Harold P. Brown and A. E. Kennelly and the chairman of this Committee (Dr. Frederick Peterson), all of which are of particular value to us in suggesting the proper method of executing criminals by electricity. From them we have ascertained the following points:

The resistance of these dogs was measured and found to vary from 3,600 to 27,500 ohms, depending upon the differing thicknesses of skin and hair and the amount of moisture between the skin and the electrodes. The amount of electro-motive force was also accurately determined, and it was found that with the alternating current as low as 160 volts was sufficient to kill a dog, and that with the continuous current a much higher voltage was necessary for the production of a fatal effect.

There are several points requiring thoughtful consideration in the application of death currents to man, which we now proceed to lay before you.

The average resistance of the human body is about 2,500 ohms. The most of this resistance is in the skin. It is evident, therefore, that the larger the surface of the electrode applied to the body, the greater will be the resistance. It is also a fact that the density of the current depends upon the superficial area of the electrode. A pole of small diameter will hence meet with less resistance, the passing current will be more intense, and the resulting current strength will be greater than when an electrode of large sectional area is applied. We think that immersion of the body in a large quantity of water to act as one pole, or the placing of large metal plates upon any part of the body, should be put entirely out of consideration. It is further well known that if metal be directly in contact with the skin during the passage of an electric current, burns and lacerations are apt to be produced. We believe that all means hitherto suggested are open to criticism upon these grounds. The posture of the criminal requires also some discussion at our hands. We think there are serious objections to the employment of any apparatus in which the prisoner takes a standing position. There are so many histories of unseemly struggles and contortions on the part of criminals executed by the old methods, that the necessity of

some bodily restraint is evident. Furthermore, the possibility of a tetanic contraction of the body from the shock of the current is to be borne in mind. In our opinion, the recumbent or the sitting position is best adapted to our purpose.

Another question of importance is to which part of the body the two poles should be applied. There can be no doubt that one electrode should be in contact with the head. The other might be placed upon any position of the body, upon the trunk or extrem-

FIG. 1.—ELECTRICAL EXECUTION.—THE Diffusion of Current through the Head and Neck where Poles are Appiied to Vertex andSpine

ities, but there are obvious reasons why the neighborhood of the spinal cord would be more advantageous. The electric current in passing through the body from one pole to another undergoes more or less diffusion through the tissues. Figure 1 is an illustration showing how a current passing from the top of the head to the small of the back will be diffused throughout a great part of the brain, and all of the tissues of the neck. The medulla oblongata—a part of the brain which is the most vital—together with all the nerves of the neck and the spinal cord, which exercise jurisdiction over the lungs and heart, will be thoroughly permeated by the current applied in this way. As the seat of consciousness is in the brain, and particularly in the center of the cerebrum, it is clear that this faculty of the mind will suffer at once if the current be sufficiently strong. The electric stream flows from the positive to the negative pole, and there might be some possible advantage in placing the positive pole on the vertex of the head, nearest the center of consciousness, although death in any case will be instantaneous.

After mature deliberation we recommend that the death current be administered to the criminal in the following manner:

A stout table covered with rubber cloth and having holes along its borders for binding, or a strong chair should be procured. The prisoner lying on his back, or sitting, should be firmly bound upon this table, or in the chair. One electrode should be inserted into the table, or into the back of the chair, that it will impinge upon the spine

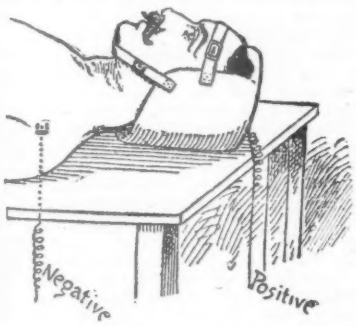


FIG. 2.—METHOD OF APPLICATION OF ELECTRODES.

between the shoulders. The head should be secured by means of a sort of helmet fastened to the table, or back of chair, and to this helmet the other pole should be so joined as to press firmly with its end upon the top of the head. Our suggestion is best illustrated in Figure 2. We think a chair is preferable to a table. The rheophones can be led off to the dynamo through the floor or to another room, and the instrument for closing the circuit can be attached to the wall.

The electrodes should be of metal, not over one inch in diameter, somewhat ovoidal in shape, and covered with a thick layer of sponge or chamois skin.

The poles and the skin and hair at the points of contact should be thoroughly wet with warm water. The hair should be cut short.

A dynamo generating an electro-motive force of at least 3,000 volts should be employed.

Either a continuous or alternating current may be used, but preferably the latter.

The current should be allowed to pass for 30 seconds.

FREDERICK PETERSON, Chairman.
J. MOUNT BLEYER,
FRANK H. INGRAM,
R. OGDEN DOREMUS.

Charlesworth's Portable Projector Apparatus.

Messrs. Charlesworth & Co., electrical engineers, of Oldham, England, have recently designed an improved search-light apparatus, especially adapted for the Suez Canal traffic. The lights required for this purpose are a search-light hung in a cage over the ship's bow, for use when under way, and an arc lamp hung in the rigging, for use when mooring at the stations. The current is generated by an engine and dynamo taken on board with the lamps and supplied with steam from the ship's boilers.

The projector, which is one of Messrs. Charlesworth's Suez Canal type, is shown

THE CHARLESWORTH PORTABLE ELECTRIC PROJECTOR.

in Fig. 1. It is of very strong construction, the barrel being of rolled cast steel, with brass rings, and longitudinal stay bars. It is fitted with best quality chance mirror and dispensing lens, and has the usual horizontal and vertical movements for directing the beam of light. In order to place the lights under the direct control of the pilot, a switch, similar in appearance to an engine room telegraph, is provided to be fixed on the bridge. Flexible armoured cables are provided for making the connections, and the necessary instruments and cut-outs are in the same box as the engine and dynamo.

The engine, projector and general arrangement are chiefly the design of Mr. Claude W. Hill, who was engaged for some time on electric light work on the Suez Canal.—*London Electrician.*

Electric Light Patents in Canada.

A despatch from Ottawa says: The Royal Electric Company, of Boston, has applied to the minister of agriculture for the invalidation of the Edison patents for incandescent electric lighting in Canada, held at present by the Edison Electric Light Company, of Montreal. Associated with the petitioners are the Westinghouse Company and the United States Electric Lighting Company.

The cancellation of the patents is sought on the ground that Edison failed to comply with the Canadian patent regulations, which provide for the manufacture of the article in Canada two years after the patent is awarded. A large number of expert witnesses will give testimony. The Bell telephone patents lost their value in Canada a few years ago for the same reason.

The Popular Telephone in Atlanta, Ga.

The election is over, and we all now turn our attention from politics to business. Would it not be better for all parties to consider the value of the telephone? Atlanta leads the van in this respect. There is not another city in the United States that has as many telephones in proportion to the population as Atlanta.

There is not a city which has as many subscribers at as cheap rate as Atlanta.

There is not a city which has as many resident telephones in proportion to the number of telephone subscribers as Atlanta.

This fact is accounted for by the sociability of our people. Everybody knows everybody. They do not live unto themselves. Their friendship is not confined to a few. They have interest in the welfare of each other, and wish to know all the incidents of the day or night by telephoning from place to place. The subscribers of Atlanta use the telephone oftener in proportion than any exchange in the country. They call and are called by telephone from early morn until late at night.

The election news comes by telegraph, and is then sent to interested parties at their places of business and to their homes by telephone.

The *Constitution* and *Journal* publish the same to the outside world. There is nothing which exhibits the vim and enterprise of the Atlanta people more than the business-like manner in which they take hold of all their enterprises. They are a unit for the building up of Atlanta, and the patronage given to the telephone as well as to other enterprises, assures the success of all.

The use of the telephone is so much a necessity of every day life that it has become a part of the machinery that is indispensible in business. The citizens of Atlanta know a good thing when they see it. They are most excellent judges, and they can and do show their appreciation of the telephone by their patronage. We advise everybody who has not got one to subscribe. A trial is all that is necessary to convince one of its value. We deplore the prevailing custom in Atlanta of non-subscribers using their neighbors' telephones so much. The value of the telephone is thoroughly established, and all who want to use them should subscribe.—*Atlanta Constitution.*

—— Columbia, S. C., is greatly pleased with her new electric light plant. The works were started up November 6th, Miss Mary Thomas, daughter of Secretary J. P. Thomas, pulling the switch that turned on the current.

East Hampton, Mass.—The People's Electric Light Company will increase their capital stock to $7,000.

Camden, N. J.—The United Electric Improvement Company filed a certificate of the payment of the capital stock.

Hyde Park, Ill.—The Hyde Park Electric Light and Power Company. Capital stock, $500,000. L. S. Hill and others, incorporators.

Burlington, Iowa.—The Burlington Edison Electric Company, Burlington. Capital, $200,000. G. Hageman and others, incorporators.

New York—The New York Eureka Telephone Company, of New York. Capital, $5,000. Thomas W. Osborne and others, incorporators.

Englewood, Ill.—The Town of Lake District Telegraph and Electric Company. Capital stock, $10,000. G. R. Watson and others, incorporators.

Davenport, Iowa.—The Iowa Belding Motor and Power Company, Davenport. Capital, $100,000. E. B. Hayward and others, incorporators.

Indianapolis, Ind.—The Merchants' Electric Light and Power Company, of Indianapolis. Capital, $100,000. R. T. McDonald and others, incorporators.

Fremont, Neb.—The Fremont Gas and Electric Light Company, of Fremont. Capital stock, $50,000. C. D. Jones, president, and C. Christensen, secretary.

East St. Louis, Ill.—The Shaw Electric Crossing and Advance Signal Company, of East St. Louis. Capital $100,000. W. P. Shaw and others, incorporators.

Fort Wayne, Ind.—The Indiana Machine Works have been incorporated at Fort Wayne, Ind., with a capital stock of $75,000. J. C. Peters and others are the incoporators.

Aurora, Ill—The Consolidated Electric Light and Power Company, at Aurora. Capital stock, $50,000. Incorporators, Ira B. Copley, Howard Knowles and I. C. Copley.

Detroit, Mich.—The International Optical Lens Company, for the manufacture of optical lenses. The capital stock is $10,000, held by Samuel C. Dustin, C. L. Dustin and Henry L. De Zeug, Jr., all of Detroit.

Chicago, Ill.—The Clark Fuel Saving and Smokeless Furnace Company, of Chicago. Capital, $150,000; for the erection of patent furnaces for burning bituminous coal without the creation of smoke. Incorporators, J. W. Thacher, G. A. Clark and W. S. Gibbs.

Spokane Falls, W. I.—The American District Telegraph Company of Spokane Falls. Capital stock, $20,000. Trustees, Cyrus R. Burns, John W. Chapman, A. B. Irwin, W. S. Norman and Jas. Monoghan. Its objects are to construct, equip and operate a district telegraph system in this territory.

Cherryfield, Me.—The Cherryfield Electric Light Company, of Cherryfield, with a capital stock of $7,000; amount paid in, $700; par value of shares, $100. The stockholders are: W. M. Nash, David W. Campbell, Charles P. Nickels, Charles Campbell, J. S. Nickels, Samuel N. Campbell, J. J. W. Coffin, Jr., B. M. Gouldrick, G. H. Ward and F. I. Campbell, Cherryfield; C. B. Story, Brunswick. W. M. Nash is president; J. W. Coffin, Jr., treasurer; and W. M. Nash, D. W. Campbell, G. H. Ward, C. P. Nickels and Samuel N. Campbell are directors.

ELECTRICAL REVIEW

Published at 13 Park Row
P. O. BOX 3329.

GEO. WORTHINGTON, - - Editor.
CHARLES W. PRICE, - Associate Editor.
T. J. McTIGHE, Electrician and Manager Patent Bureau.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.
TELEPHONE CALL, 546 JOHN.

Timothy W. Sprague, Room 58, No. 178 Devonshire Street, is our representative at Boston, Mass.
Mr. C. C. Haskins, City Hall, Chicago, Ill., represents the REVIEW in the West.

SUBSCRIPTION.

United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.
Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

ADVERTISING.

Transient, 25 cents per line, nonpareil.

DEALERS SUPPLIED BY
The Albany News Company, Albany, N. Y.
The American News Company, New York, N. Y.
The Baltimore News Company, Baltimore, Md.
The Brooklyn News Company, Brooklyn, N. Y.
The Central News Company, Philadelphia, Pa.
The Cincinnati News Company, Cincinnati, Ohio.
The Cleveland News Company, Cleveland, Ohio.
The Colorado News Company, Denver, Colorado.
The Detroit News Company, Detroit, Mich.
The International News Company, New York, N.Y.
The Minnesota News Company, St. Paul, Minn.
The Montreal News Company, Montreal, Canada.
The National News Company, New York, N. Y.
The Newark News Company, Newark, N. J.
The New England News Company, Boston, Mass.
The New Orleans News Company, New Orleans, La.
The New York News Company, New York, N. Y.
The Northern News Company, Troy, N. Y.
The Omaha News Company, Omaha, Neb.
The Pittsburgh News Company, Pittsburgh, Pa.
The Rhode Island News Company, Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The South West News Company, Kansas City, Mo.
The St. Louis News Company, St. Louis, Mo.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton, Ontario, Canada.
The Union News Company, New York, N. Y.
The Washington News Company, Washington, D. C.
The Western News Company, Chicago, Ill.
The Williamsburgh News Co., Brooklyn, E.D., N. Y.

EDITORIAL ANNOUNCEMENT

Address all communications and make all Express Money orders, P. O. orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, NOV. 24, 1888.

CONTENTS.

	PAGE.
Electric Targets	1
A New Electric Semaphore	1
Write to Mr. S. S. Leonard, Minneapolis, Minn.	1
The U. S. Illuminating Company Enjoins the Board of Control	1
The Electric Shell	1
The Gardiner Auxiliary Fire Alarm System	1
An Editor's Variegated Ink	2
The Advance in Telegraphy	2
C. H. Summers, the Chicago Electrician, Gives Some Telegraph Reminiscences	2
The Execution of Criminals by Electricity	2
Charlesworth's Portable Projector Apparatus	3
Electric Light Patents in Canada	3
The Popular Telephone in Atlanta, Ga	3
New Corporations	3
The New Aspect of Lightning	4
Our Chicago Letter	4
Our Boston Letter	5
The Eickemeyer Dynamo	5
Executive Committee Meeting	5
Telephonic News	6
Value of the Telephone	6
The Electrical Execution	6
An Electric Railroad in a Snow Storm	6
"Practical Pointers"	6
Electrical Notes from Alabama and the South	7
Telegraphic	7
Telegraph Lines in Oregon	7
Electric Power	8
Earnings of the Westinghouse Companies	8
Electric Light for the Squares in Philadelphia	8
Large Horse-Power Electric Motors by the Baxter Company	8
New Electric Railway Work	8
The Electric Club	9
Electric Light News	9
Electrical Patents	11

Keeley is now in jail, as such frauds should be.

The lake copper output from January to October was 45,018 tons, against 39,615 tons during the same period last year.

Our own Board of Electrical Control, we fear, cannot "point with pride" to the success of its work in the past. And we fear for its future.

This is number 13, of volume 13, of the ELECTRICAL REVIEW, published at 13 Park Row. And we think our many thousand readers will pronounce it a very good number.

The *Electric Current* is a new well-printed candidate for favor from the electrical public. It is published at Louisville, Ky., and is issued monthly. The first issue contains 16 pages of well selected matter.

Let all good electrical people work for the advancement of the National Electric Light Association. The value of such an organization has not yet been nearly so widely recognized as it deserves.

The duration of the lightning flash seems, at least, sometimes to be longer than is supposed. It may last several seconds, according to Trouvelot, who recently photographed such a one, or perhaps they're even longer now than they uster was.

The American Institute Fair, now in progress in this city, is more successful than ever before. It is largely attended, afternoons and evenings, by a pleased crowd of visitors, who find so much to interest them that a second and third visit often follows. The reduction of the price of admission to 25 cents proves to have been a wise move.

In these days, when so often the fame of the student is taken from him by legal technicalities, it is peculiarly satisfying to see the genius of Gramme acknowledged and placed on record. The French Institute never did a worthier service to the cause of science than now, when it awards him the Volta prize of 50,000 francs. Gramme's work in perfecting the continuous current dynamo is thus admitted to be wholly independent of Pacinotti's work.

Professor Porter, the astronomer, has written a book on "Our Celestial Home," in which he seems to have no trouble whatever in saying just where Heaven is, and giving other interesting facts concerning that Kingdom not to be found among religious books, so far as our researches go. But when it comes to the kind of light they have up there, its nature, and exactly what it is, he can't find out. We're having much the same trouble down here.

After Dr. Parker's lecture, before the Electric Club last week, a lot of discussion took place over the apparently inexplicable extinguishment of the continuity of a wire by a flash of lightning far beyond the wire. Chemical, mechanical, electro-chemical and other reason were suggested. It seems, however, easily understood when we take into account the fact that the wire was close at hand, while the flash was at least three-fourths of a mile distant. The wire was not in the sharp focal range of the lens, and this taken with the work done by reflection from the rear surface of the plate in the camera is sufficient to account for the peculiarity.

In the current number of *Revue Scientifique* appears Mr. E. Durand-Grévillés second article on ballooning across the Atlantic, articles, it is said, containing a deal of information in aeronautics. He says that now the storage battery has come, the project seems more feasible, and that as soon as this remarkable contrivance shall have been fairly perfected, we shall see the feat accomplished. His theory is that above the strata of storms the air is still. Into this region the balloon is to be lifted by its own buoyancy, and through this deathless stillness the revolving fans, driven by electricity "stored" in secondary batteries, are to propel the balloon across the waters.

THE NEW ASPECT OF LIGHTNING.

Dr. Parker's very interesting paper on lightning is worth studying, and we have no doubt it will start a number of investigators at work delving in this new field. Whether the Parker theory is right or wrong, its projector certainly brings out some very curious phenomena on the part of the flash. The wary camera seems to have caught the lightning swerving from the path of rectitude. It seems as if the flashes gyrated and cork-screwed in a most unmistakable manner. Whether the spiral form shown by some of the views is the direct picture of the electric current's path, or a photic effect caused by the current but not corresponding axially with it, remains to be seen. If the spirals are actually the path of the current, the fact has an important bearing, since it at once accounts for the mysterious behavior of lightning at times. According to the facts as to distance and surrounding objects, the diameter of the spirals, if such they were, must have been many feet. With the hurricane of electricity in a strong flash, hurling itself corkscrew-fashion against a straight lightning rod, is it any wonder the latter cannot stand the onslaught? Is it any wonder the gyrating giant runs off the track, so to speak, and plays havoc with the surroundings? Here is food for thought and practical study. Will it lead to a corkscrew-shaped lightning rod? Perhaps the much ridiculed spiral of copper had some hidden merit, after all.

The subject has great interest, and Dr. Parker has at least opened a new page in the wonderful chronicles of electricity, and we will look for further researches through the timely aid of the camera.

The invention of Prof. S. S. Wheeler's electrical fire engine proves that even if electricity can start a fire, as the caustic critics of the daily press allege, it is at least able to put it out again, and that's more than gas can do.

The paragraph on "Commissionaire d'Electricite Hewitt," printed in the *Evening Telegram* last Thursday was translated from *La Paye* for the REVIEW a month ago word for word the same. Our E. C., we are sure, would have given credit had it not been imposed upon.

Mayor-elect Grant is pledged to put "all the wires underground." Oh, that he were pledged to root up all the steam mains. He ought to remember that many uninformed persons voted for him under the impression that he was the late Gen. U. S. Grant, and hence, with that admirable warrior's example before him, go slow till he is well informed of the difficulties we have to contend with in burying all the electric wires.

The effect of continual use of the telephone on the ear has occupied the attention of many students—some of whom differ quite widely. At a recent meeting of the Otological Society in Washington, a paper was read on the subject, the conclusion being that only those already afflicted with ear disorders are affected by the constant shocks, caused by change in intensity of current and the changing of connections. That is to say, those whose hearing is enfeebled, especially when the trouble is in the "middle ear," cannot stand continual work at the telephone.

Prof. Oliver Lodge, in a very interesting study on the modern view of electricity, says that light is an electrical disturbance, and that light waves are excited by electrical oscillations. Our present system of making light artificially he characterizes as wasteful and ineffective. We want a certain range of oscillation—between 7,000 and 4,000 billion vibrations per second. Perhaps, speaking theoretically, this is sound reasoning; but practically, we don't see how anything that serves a purpose as well as we have learned to serve it can be wasteful, nor how, when a thing is accomplished satisfactorily and thoroughly, as thoroughly as we can appreciate it, can be called "ineffective." It must be effective because it succeeds, and must be regarded as economical, at least until we find a cheaper means.

OUR CHICAGO LETTER

(Special Correspondence.)

In the Bell telephone case, which the Supreme Court has just remanded back to the Massachusetts Circuit Court for trial on its merits, there is much interest felt in Chicago, for sundry reasons. Professor Gray, while a resident of Highland Park, is virtually a citizen of Chicago. Then in addition to this some half a dozen or more of the opponents, competitors or what-not, of Bell are Chicago parties. This was the town of all others in the northwest, where each of these various companies strove to get a foothold and compete with the Bell people in the hullo business.

The most potent aid to reach the people is the daily newspaper. Newspapers are not run for health, for exercise or for fun. They require to have what the printer calls "sugar," in return for services rendered. "Sugar" is not always a direct representative of dollars deposited with or bonds held by the United States Treasury. It is a pretty thoroughly understood fact that in certain secret drawers of sundry newspaper safes are pictured representations of one form of "sugar" which will never, never, never be worth more than the same number of square feet of horse half-sheet posters or second hand Japanese kandkerchiefs, unless Bell can be brought down. So every time there is a chance, pop go the little guns at Bell. One fellow fires "Globe" missiles at him, while a second bangs away with "Interstate" shot, and a third shoots "Cushman" schrapnel, "Molecular" grape, or "Pan Electric" canister. That's why, principally, that we all take an interest in anything that seems likely to make it lively for the Bell people.

Sifting the whole matter thoroughly, and blowing away the chaff, there seems very little of this decision save that the case has been remanded back to the inferior court for trial.

The annulling of the two basic patents would not by any means throw telephony into the public domain. There are, some distance this side of these in point of age, several very valuable inventions in telephony, without which competition would be futile by any of the would be competitor companies, and the telephone business is to an extent much like the post office business. As a rule only one system amounts to much in any one town.

The mayor submitted a communication from the Chicago Telephone Company on Monday—12th—and recommended its reference to the Finance Committee, and its being printed, in order that the company might be heard in its own defence:

The following is a concise abstract of the document:

It sets out that by the assent of the city of Chicago, expressed by permit, contract, ordinance and acquiescence, the company has erected a system of telephones which is only exceeded in number of subscribers by one city in the world.

This has been accomplished at an outlay of over $1,000,000. All construction has been done with the express consent, and often under the direction, of city officers.

The ordinance of October 15 is referred to, which limits rates to $95, $85 and $75, as being impossible of acceptance by the company. A misapprehension has arisen as to the rights of the company, the amount of free service the city should have, and the fairness of the price charged subscribers. The first of these has been alluded to above.

As to the second, the right to certain free service is conceded to the city, and that service is given. In addition to this a special arrangement was made by this company with the American Bell Company, by which telephones are rented for the use of the city's police patrol system, lower than to any other customer for similar service. A concession is made to the city, including these rebates, private lines, etc., of over $10,000, in excess of the requirements of the ordinance. The following table of rates in towns of 200,000, or over, shows how the Chicago Company's charges compare with those of other places:

	Rate.	Subscribers.
New York	$150	7,218
Chicago	125	4,735
Boston	120	3,011
Philadelphia	120	2,888
Cincinnati	100	3,110
Baltimore	100	2,171
St. Louis (in litigation)	100	2,106
Pittsburg	100	1,961
San Francisco	60*	2,706
Brooklyn	90	3,563
New Orleans	75	1,158

*And five cents for each talk.

The R. R. Company charges more to carry a passenger 1,000 miles than 100; a barrel of sugar costs more than a pound, and an advertisement costs more in a newspaper with 100,000 daily circulation than in a weekly of 10,000. Where less is charged less service is given, and the service costs less.

The ordinance is considered void, because counsel advises that the city's charter does not confer the right to regulate the company's rates.

The company is willing to adjust any existing differences, and will discuss them with any committee to whom the matter is referred, and desires to act in all fairness and good faith with all, and submits that it can see no good reason why this interest should be singled out by the city and weighted with burdens imposed on no other corporate interest in Chicago.

The communication is signed The Chicago Telephone Company, by George L. Phillips, president; Norman Williams, John De Koven, J. R. Jones, John B. Drake, John Crerar, directors.

Then Ald. Ernst, from the Committee on Licenses, reported the following resolution, which was adopted unanimously:

Resolved, That the City Law department is hereby instructed to take such steps as may be necessary to have the injunction in the case of the Chicago Telephone Company vs. The City of Chicago dissolved, and that it is hereby directed to commence proceedings to test the authority of the Chicago Telephone Company to occupy and use the streets and alleys of the City of Chicago for telephone purposes.

He followed this resolution by presenting an order directing the Commissioner of Public Works to prosecute the telegraph and telephone companies for having failed to place their wires underground, as provided by the ordinance of 1883, and moved the suspension of the rules so as to act on the order. The motion to suspend the rules was lost—18 yeas, 28 nays, The order was referred to the Committee on Fire and Water.

Friday afternoon President Phillips appeared with his attorney, F. S. Winston, before the Finance Committee, as proposed in the communication to the Council on Monday. Mr. Winston said that as to the forfeiture of right by transfer from the Bell Company, the present company could retransfer the franchise. Bother and expense would ensue and more or less ill feeling must result from this way of handling the vexatious question. To avoid all this, the Company was ready to offer as a basis for future negotiations, 2½ per cent. of its gross receipts, as a license, and stipulate that present rates should not be increased; and any negotiations entered into should not be a bar to the city's right to apply to the legislature as had been suggested. President Phillips stated that the company was now giving the city a service in free municipal instruments which was worth at current rates $10,090. It was willing to add to that 2½ per cent. of its gross earnings.

After considerable discussion *pro* and *con*, which developed the fact that there was considerable uncertainty as to the legality of the ordinance and the right of the city to regulate the rates of rental, the committee adjourned until next Friday when the matter will be gone over again.

Every now and then somebody accidentally drops hot solder on the cloth of the office desk, or on some garment, and to get it off by any ordinary means injures the fabric. To get it off without damage, dissolve the solder with mercury and it will brush off clean.

Chicago, Nov. 17, 1888. C. C. H.

Personal.

Mr. Geo. C. Maynard, one of the telephone pioneers, came over from Washington, D. C., last week, and made a number of his New York friends happy by calling on them.

Mr. A. R. Foote, of Cincinnati, Ohio, is visiting New York with headquarters at the Electric Club. Mr. Foote's many friends among electrical people of the East gave him kindly greeting.

Mr. J. H. Reid, the wide-awake Western manager of the Mather Electric Company came in from Chicago last week and is spending a few days with Eastern friends. Mr. Reid recently secured the contract for lighting the *Pioneer-Press* building in St. Paul, and will see that one of the finest in stallation in the country is put in.

OUR BOSTON LETTER.

(Special Correspondence.)

The New England office of the REVIEW is indebted to the Westinghouse Electric Company for a copy of its beautifully gotten up catalogue, which is a work of art, in addition to presenting, in an interesting manner, an explanation of the company's varied and extensive apparatus for electric lighting and power.

Since the destructive fire in the first district station of the Edison Illuminating Company, in Head Place, in June last, the building has been thoroughly remodeled and rebuilt, and everything is running smoothly in the reconstructed station, which is a model of convenience, and fire-proof in every particular. On the main floor, opposite the entrance, are the private offices of C. L. Edgar, general manager, and W. A. Hill, business manager. These are in the rear of the building, and in front of them is a large room occupied by Mr. W. H. Atkins, superintendent of construction, Mr. Eliot L. Caldwell, power contractor, Mr. George E. Spiller, canvasser, and Mr. C. R. French, stenographer. The front office is occupied by the bookkeepers, Messrs. F. H. Spach and F. W. Baker. The rooms are all brilliantly lighted, several varieties of Bergmann reflectors being used.

On the same floor, on the left of the building, is the extensive dynamo room, where 16 No. 20 dynamos, with a capacity of 12,800 lights, are running, supplying current for lights and motors throughout the city.

Mr. H. H. Niles is the superintendent of the dynamo room and in it has the latest improvements in arrangement and apparatus. The dynamos feed to his wires leading through the equalizers to 14 feeders. The ampere meters connected with each dynamo are by themselves together with the resistance boxes to the left, and the whole arrangement is such that one man can easily take care of the equalizers and also watch the pressure indicators. The switches are all on slate slabs and wires run entirely over porcelain insulators.

Immediately below the dynamo room is the engine room, which presents the pretty sight of eight 125 horse-power Armington & Sims' engines, running at high speed, but without a tremor, so perfect is their adjustment and so solid their foundations. Steam is furnished by six large tubular boilers and one of the Babcock & Wilcox pattern. The boiler room is two stories high and has room, therefore, for twice the boiler plant. In fact, the entire building is constructed for over twice the present plant, being built for 40 dynamos with 20 engine beds. The exhaust steam heats several adjoining build ings. The steam and power plant was furnished by the Jarvis Engineering Company. The link belting manufactured by Mr. Charles L. Ireson, of this city, is used entirely and gives the utmost satisfaction. Over 700 feet were required for the present plant. The engine room is very high, studded and well ventilated. The wires entering from the conduits are easily accessible and not in the least crowded. Provision has here also been made for a large increase in the plant.

The meter room occupies the space under the offices and is in charge of Mr. C. R. Brown. A small Sprague motor furnishes power for the grindstone used in clearing the strips.

The fact that this station supplies over 11,000 incandescent lamps and current for 125 motors representing 400 horse power, shows its importance and the wisdom of the company in guarding against a recurrence of fire by putting in an entirely fire-proof construction. The Bowker Street Edison station supplies current for 4,000 lamps and about 15 motors.

A new accumulator plant has just been installed by the Somerville Electric Light Company at Somerville, Mass. Such a step was determined upon only after a careful investigation of the merits of the system, and the company now has no cause to regret its action. The plant was furnished by the Accumulator Company of New York, and the wiring and installation attended to by Mr. J. L. Kimball, of the Massachusetts Accumulator Company. Five separate substations have been established as follows: One under Odd Fellows Hall, one under Masonic Hall, a third in Davis Square, the fourth in Union Square, and the fifth in City Hall building. All are placed in basements, occupying what was practically waste space before, and great care has been taken throughout with the insulation, all shelves being nicely varnished and the batteries placed on insulating trays.

At one of the stations 100 volt lights are used and the batteries furnish 58 lights, while the machine, the batteries having been charged, furnishes 66 lights, giving a total of 124. At the other four stations Sawyer-Man 60 volt lights are used, and the batteries furnish 42 and the machine 47. The entire 165 cells, together with the dynamo, furnish 500 lights.

The dynamo is started sometime in the afternoon, and shut down in the evening. The entire circuit is from three to four miles long. The dynamo is of special construction, made by the Electro-Dynamic Company, of Philadelphia, especially for charging accumulators, and is rated as a 1,000-volt 40-ampere machine. Each station has its ampere meters and regulating switches, by means of which the light can be kept at a constant or any desired brilliancy. Among the buildings now lighted are the Masonic Hall, whose beautiful combination electrolier is a marvel of design. Special resistance boxes are to be placed in this building in order that the light may be dimmed. All lamps on the 100-volt battery circuit in Union Square are now taken, and there is a probability of an early increase.

Mr. A. E. Proal, assistant manager of the Baxter Electric Manufacturing and Motor Company, has been making a trip in Maine, New Hampshire and Massachusetts with Mr. Frank Ridlon, manager of the N. E. department, looking up the interests of the Baxter Company. Matters were found in a very satisfactory condition, and the gentlemen returned to Boston on Saturday.

Mr. F. J. Parsons, Ph. D., entertained a large audience at the club rooms on Wednesday evening, by his talk on "Central Station Practice in Germany." Mr. Parsons has had a large experience in that field, and presented many interesting points. Among the speakers in the discussion which followed was Mr. Tei Hasegama, M. E., a Japanese gentleman who is looking up electric lighting in this country for his government, with a view of introducing this mode of illumination in the Japanese empire.

Mr. Charles A. Stone, a technology graduate, has become associated with Mr. Howard in the management of the local "C. and C." Motor Company.

Busy Boston visitors last week were Mr. G. T. Manson, of the Okonite Co., and Mr. A. H. Patterson, of the Phœnix Glass Co.

The Tremont Electric Light Co. is to light the factory of the Everett Piano Co., at Walpole, Mass.

The students in the electrical courses of the Massachusetts Institute of Technology have formed an electrical club for research and mutual improvement.

New contracts of the New England Sawyer-Man office, are: Walworth Light and Power Co., one 500 light compensating dynamo; Beddeford-Saco Light and Power Co., one 400 light dynamo; Berlin Falls Electric Light Co., 300 light compensating plant; Carter & Rogers, Lebanon, N. H., 200 light plant; Nonantum Worsted Co., Newton, Mass., 250 lights; F. A. Kennedy & Co., Cambridgeport, Mass., 350 lights; C. D. Morse, Newton, Mass., 75 lights.

The Sawyer-Man Co., will remove its office to the Hathaway Building, 620 Atlantic avenue, some time within a month.

The Schaefer Electric Co., of this city, is reaching into the Western field and building up a good business in that section.

Manager Burnham, of the Electric Gas Lighting Company, has just arranged with Mr. Thomas W. Lane, formerly superintendent of the Western Electric factory in this city, and more recently with the Bergmann Company, in New York, to take the superintendency of the factory of the Electric Gas Lighting Company, in this city. Mr. Lane is a man of large and varied experience, and fully competent to assume the responsible position to which he has been called, and the arrangement insures a continuance of the prese.t fine qualities of the company's products. In this connection it is interesting to note that the October sales of the company were the largest in its history.

T. W. S.

Nov. 19th, 1888.

THE EICKEMEYER DYNAMO.

Mr. Eickemeyer has just completed a large dynamo of his peculiar "iron clad" form, to be used in an accumulator works for forming the plates. The capacity ordered was 1,000 volts and 40 amperes, and the following details of the machine will be found of great interest:

The total weight is 6,000 pounds, the major portion of which is the cast iron casing of the machine.

The armature is of the drum type, 18 inches diameter and 15 inches long, presenting a sectional area of 200 square inches for the peculiar magnetic circuit typical in this machine. The space between the armature core and the field poles is only $\frac{1}{16}$ths of an inch, and there is but a single layer of wire on the armature, making 240 turns, and connected at every third turn to a commutator of 80 segments. The winding is No. 11 B. & S. gauge. The total length is 1,560 feet, so that the potential is produced out of but 780 feet. Briefly, the electrical factors are:

Armature: 240 turns, 1,560 feet, No. 11 wire.	
" Resistance between brushes	0.57 ohms
Field: 14,880 turns, No. 21 wire.	
" Resistance (shunt to armature)	1,600 "
Speed	850
E. M. F. at terminals	1,000 volts
" " per foot of wire	1.28
Current in external circuit	40 amp.
" Field shunt	0.625 "
" Armature	40.625 "
Energy absorbed in field	612 watts
" Armature	912 "
" Friction & Foucaults	600 "
Net commercial efficiency	94.5%

The machine runs beautifully. A perfect balance is obtained by the construction, no sparking is visible at full load, and the whole performance points to the fact that the principle can be readily carried into machines of almost any size. Machines of 300,000 watts capacity can be as readily made as the foregoing, and will run perfectly.

Messrs. J. H. Bunnell & Co are to be congratulated upon their judgment in taking up a machine of such simplicity and universal application.

Executive Committee Meeting

OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION, IN PITTSBURGH.

In accordance with call issued by Chairman B. E. Sunny, of the executive committee of the National Electric Light Association, a meeting of the committee was held in Pittsburgh, Monday of this week.

The gentlemen in attendance were: S. A. Duncan, president of the association; B. E. Sunny and W. A. Kriedler, of Chicago; E. F. Peck, of Brooklyn; J. F. Morrison, of Baltimore; T. C. Smith, of Philadelphia. Mr. A. V. Garratt, of New York, secretary and treasurer of the association, and W. H. Harding, former secretary of the association, were also present.

Details of the New York headquarters were discussed in full, and the plans suggested by Mr. A. V. Garratt were laid before the Committee and approved.

The date of the Chicago convention was settled upon as February 19, 20, 21, 1889.

There is every prospect of this Convention being not only largely attended, but plans will be consummated whereby an exhibition of electrical apparatus will be made far exceeding anything yet attempted by the Association, and which will be of great credit to the electrical industries of this country.

The meeting adjourned subject to call of the chair.

The Hartford Dynamic Company has opened offices in New York City, in the new Aldrich Court, No. 45 Broadway, one of the finest of the modern business edifices in the city. General Manager H. M Linnell will make his headquarters in New York, and President Chas. K. Wead will remain at Hartford. This company has done a business in the 18 months since its organization far ahead of expectations, and has been quite successful in handling the improved Russell engine. The Dynamic Company contracts for electric light, power and railroad plants, and will probably make a specialty of the construction of electric railways.

Telephonic News

*** The poles are being erected for the long distance telephone at East Hampton, Mass.

*** The telephone wires in the city of Leavenworth, Kan., were badly crippled last week by the heavy snow storm.

*** By the time another presidential election rolls around, the telephone system will ive us news from Chicago and the west.

*** The Philadelphia Company's telephone poles on Penn avenue, which were cut down by property holders opposed to their erection, have been replaced.

*** All the lines of the "Long Distance" Telephone System, between New York and Boston, are required for the demand for the service, and the company is again compelled to arrange for an increase of facilities.

*** The telephone line between Atchison and Topeka, Kas., was completed last week, and is now ready for business. John R. Mulvane, president of the Missouri and Kansas Telephone Company, was the first gentleman to talk over the new line.

*** Councils' Electrical Committee of Philadelphia, has agreed to report favorably an ordinance authorizing the Merchants Electric Light Company to lay underground conduits across Dauphin and York streets on the east side of Front street for the purpose of extending their present facilities. It also gave its approval to the connecting of St. Agnes' Hospital with the city departments by telephone.

*** In the case of the borough of Philipsburg, Centre Co., Pa., which attempted by ordinance to levy a tax or license of $1 per pole, per annum, against the Central Pennsylvania Telephone and Supply Company, and which was resisted by the latter, a decision on a "case stated" was rendered November 9th inst., by President Judge A. O. Furst, in the Court of Common Pleas, of Centre County, in favor of the telephone company, and adverse to the borough, with costs of suit.

*** Experiments in submarine telephony have been made by the French Government at Brest. The instrument is called a hydrophone, but is practically a microphone, and was invented by M. Rarrare. The sound of a bell weighing 300 pounds, which was struck under water, was heard at the greatest distance permitted by the configuration of the bay—namely, 5,200 meters (3¼ miles). Excellent results were obtained on board a boat in motion, the bell being distinctly heard 1,400 meters off, as well as the noise of the screw of the tug on board which the surrounding instruments were placed.

*** In its *Bulletin* of November 15th the Boston News Bureau says: "It is now 12½ years since the Bell patent was granted. Up to this time the courts have uniformly answered the assailants of this patent by saying that Bell was the first inventor and was entitled to great praise. Apparently the last decision of the Supreme Court is to the effect that before the patent can be repealed it must be proved clearly that Mr. Bell perjured himself when he swore he thought himself the first inventor. It does not seem likely that this was the case or that the courts will think so."

Value of the Telephone.

The value of the telephone has never been more apparent than in the campaign of 1888.

It has increased the facilities of communication between the villages of Chautauqua county to such an extent that in many respects they are one community. Election night many thousand of words of election returns were sent from the Jamestown exchange to the toll stations in nearly every town, enabling those people to learn the latest regarding election who, before the telephone came into use, were from one day to several in hearing the national result at the polls. The efficiency of the telephone service in this region is due in large degree to the superintendent of the district which includes Chautauqua county, J. W. Stearns, of Jamestown, who gives his best efforts to serving the customers of the New York and Pennsylvania telephone and telegraph company in the most perfect manner possible. The latest improvements are brought into use, and nothing is left undone to give satisfaction to all, and increase the value of the telephone to business men and in residences. —*Jamestown (N. Y.), Journal.*

The Electrical Execution.

SEVERAL HIGH AUTHORITIES DISCUSS ITS ADVANTAGES AND FAILINGS.

Under the above heading the N. Y. *Daily World*, of November 16th, has the following:

The Electric Club met last night to listen to a lecture by Dr. Moses Greeley Parker, of Lowell, Mass., on the peculiar rotary motion found in lightning and other electric currents.

Dr. J. M. Bleyer, who has just returned from Germany where he assisted, last Spring, Dr. Morell Mackenzie in his operations on the throat of the late Emperor Frederick, spoke of the plan for killing criminals by the death helmet charged with electricity. Dr. Bleyer said that the method would be most useful to science, and the helmet and recumbent position, as illustrated in the *World*, would insure instant death without suffering. He spoke of hi experiment with a dog which he killed in one-sixteenth of n second by this process.

Dr. Otto Moses said to the *World* reporter: "I am strongly opposed to electricity being used in any form for the execution of criminals. This use of electricity will certainly impair its value greatly for domestic purposes. If we make it an instrument of death, women and others will oppose its introduction into the household. It will be surrounded by a certain terror and mystery which will check its progress.

"Then, people are differently affected by electricity, and their conditions at the time of an electric shock vary. A shock which might kill a man at one time would only stun him at another, and a current which would prove instant death for one would only place another in a trance or stupor."

C. J. H. Woodbury said that he thought electricity would be the best method of execution, although as to the helmet system he had not given it much attention. The general sentiment of the Club was against its adoption.

An Electric Railroad in a Snow Storm.

On the 9th of November St. Joseph, Mo., was visited by a tremendous snow storm, which, according to the *Daily Gazette* of Saturday, November 10th, "Completly paralyzed business, and shut this section of the country off from the communication of the world."

During this storm, according to the same paper, nearly all the telephone, telegraph and electric light wires were weighed down by the damp snow and broke. In spite of this, the overhead system of the electric railroad, owing to the care with which it had been erected, remained standing and unbroken, and the cars kept running. During the entire storm, according to the *Gazette*, "Not a wire was broken down, nor was any other defect in the appliances developed. Telephone wires were down in every direction and the telephone wires in the city suffered great damage, and the wires on the Union Passenger Street Line stood the test without the slightest damage."

It is very gratifying to railroad managers and the general public alike to feel that electric railroads are to be relied upon at all times, and that there is no danger of their stopping under any conditions of weather.

We congratulate the Sprague Electric Railway & Motor Company upon this most signal evidence of the reliability of their railway under these trying circumstances.

*** Telephone subscribers at Birmingham, Conn., do not take kindly to the new system in vogue of calling subscribers by number, and nearly 50 of the same who have been interviewed, stated that they will not adopt the change recommended. And yet it is for the benefit of the service that they are asked to do it.

"Practical Pointers."

BY C. C. HASKINS.

There is no denying the fact that the dangers of electric lighting currents have at times been greatly exaggerated, and it is also equally true that our fraternity is largely responsible for this condition of popular belief. Electricity is a new study with the majority of the general public, and the more thoroughly it is understood by this primary school class, the more readily will the scholars accept the situation and view it in its proper light. There is a fascination in electricity, in its action, in its power, in its idiosyncracies, and it is highly proper the public should know the real danger which may lurk beneath a brilliant display of this most wonderful of nature's forces. No power on earth can prevent the public from playing more or less carelessly with almost any new thing, and where the recent plaything is a harmless one, there can be no valid reason for checking that curiosity. When the plaything is of a dangerous character the proper warning should accompany the exhibit.

Misrepresentation, deception, can only win for a brief season, "and at the end there cometh bitterness and woe." No one person is mentally the superior of all the rest of the world; and in the long run the perfectly square deal is by far the best.

It has often been a source of wonder to me, and I look upon it as an indication of weakness, that the brotherhood of Ohm should so frequently seek to shift the responsibility of its calling by methods of comparison hardly worthy of a schoolboy, when the dangers of electric currents are discussed. It is no proper defense—it is no valid excuse—not even a palliation, to say, that for every man killed by electric current the toy pistol, the kerosene can or burning gas has carried off a dozen or a score; or that a hundred fires occur from matches or gas, to one from the electric current! What the public—the patrons of electric light and power corporations—the patrons from whose purses we are endeavoring to entice the dollars—ask, and are entitled to know, is, not the comparative death rate or property loss between electricity and something else as it stands to-day, but how much can you, gentlemen, better the showing when the next annual statement comes to be made up.

Brother Woodbury was not far out of the way when he said the lineman was in more danger from the force of gravity than from the action of electrical force. Then, let us consider gravity, and take such precautions as shall render that harmless, or at least reduce the danger to the lowest minimum. That thousand-tongued old gossip, Madame Rumor, will never lose time nor opportunity to charge the "death-dealing fluid," as she calls it, with anything in the way of a casualty which occurs within gun shot of a dynamo or as near as forty rods from an electric lamp or a motor, provided the enterprising newspaper commissary can dish up distorted facts enough to give the gossipers a good square meal.

Now and again when I see exaggerated accounts of some trivial affair connected with electricity, and note the avidity with which the daily press of newspaperdom howl over it, I am reminded of the wholesale cackling in a barn yard, when some silly pullet has accidentally run upon a toad in the fence corner.

How to improve the installation of a plant has been with me a prolific source of thought; in my experience I have had my attention drawn to some points which I hope may interest the readers of the REVIEW and I have selected only those the importance of which are supported by personal experience.

A dead wire (I call them tramps), innocent in itself, may be the indirect cause of a large amount of mischief. One of these which I located was an element in a very curious combination. In fastening an arc light wire to the insulator on the framework of an elevator, in a cellar, a naked iron wire had been used for a tie wire. There was an unused bell wire—a second tramp—which made a nuisance of itself by getting in the way of the janitor, so he wound it round the tie wire to take up the slack. A telephone wire in the building became unduly intimate with that tramp wire, and one day, when a ground developed at another point on the line, a flame suddenly manifested itself among the paraffine wires in a telephone tower, on the roof of a five-story building in the heart of the city. Fortunately the dynamo man was notified in time, so that little damage was done. Now, look at the combination of elements necessary to produce that fire: Underwriter's wire—a naked tie wire, which the zealous lineman pulled so hard as to cut through the paint and cotton—a lazy janitor—a tramp wire—a poor piece of telephone work, and a ground on an arc line. It does seem as if some one of this necessary collection might have been avoided.

In another instance, the combination was of a somewhat different character. The employé whose duty it was to trim an outside hanging lamp, failed to raise it quite high enough, leaving the wire resting upon the stay wire of an iron sign.

At another point on the same circuit, a tramp wire was permitted to fall across the line, and an accommodating shower happening along just then, furnished the missing link, and an alarm for the fire department. The two blazes, one at each crossing of the circuit, would have been easily prevented by the use of almost any wire other than the underwriter's.

The combination which resulted in a death at Cincinnati was one which was attributed to poor wire. There was a tin speaking tube from a theatre stage to the curtain man, and the light wire had been worn bare by contact with the ragged edge caused by hammering the mouthpiece to call attention to the tube. A bell wire lay in contact with the gas pipe. The circuit was completed by the stage manager, who was instantly killed, the current passing from the speaking tube to the gas pipe through his body.

In all these instances, and many more might be mentioned, the tramp wire has been the medium of mischief, and a proper supervision on the part of the electric light company would have saved the obloquy and distrust such cases have always occasioned.

In the matter of manufacturing, there are points which, from the standpoint of a disinterested party—disinterested in any particular system, plant or method—will bear criticism.

A short time since, my attention was drawn to the inconstant insulation of a basement, where one day 100,000 was less than the maximum, and the next it might be less than one-tenth that amount. I found an association here, also, the elements of which were poor wire in combination lamp fixtures, and a material which I had never before known to be used as an insulator under any circumstances, one too, which I cannot now recommend for general use—it was leather.

I have heard of a shoemaker whose opinion was asked as to the best method of mending a boiler, and his answer was, "there's nothing like leather—patch it with leather." Comment is unnecessary.

No little trouble has been experienced in some localities by the use of an earthenware insulator which absorbs moisture, and thus grounds or wastes the current. The ordinary porcelain drawer knob is sufficiently unreliable, but to form a combination, as I have seen one formed, which included underwriter's wire, earthenware insulators with an occasional glass insulator wrong end up, seems to me to be courting all sorts of waste as well as every other possible evil.

Capillary attraction is one of the electric light man's most insidious as well as most relentless foes. Experiments have been made which show that water may be carried long distances by a string or a piece of tape and this, too, when the fibre is assumed to be waterproof. One experiment of this character showed dampness which had traveled no less than one hundred and thirty feet through a cable—through the length of the insulation of the cable.

It is not uncommon for linemen, where lead-covered cables are used for underground work, to lay the cable with a temporary joint one day and 24 or 48 hours afterward to make a permanent joint. During that delay between the temporary and permanent joints, moisture has generally crept in, and unless a thorough boiling in paraffine is given it before putting on the sleeve, the joint will one day give out.

Every few days we hear of a new tape—sometimes only the name is new—which, unlike its predecessors, is thoroughly waterproof, and wholly reliable, if we take the salesman's word for it. In five year's experience, however, I find that any insulator which is made of a fibrous material will carry water, and hundreds of joints, in both high and low potential circuits, give out every year from that cause alone, because a single thread of the tape is allowed to make contact with the conductor. I have found leaky joints in very many instances faulty alone from this one cause. The outside was well covered with insulating paint or compound, or perhaps shellac, but one little thread had caused all the trouble.

It is not uncommon for the constructor in letting in a loop or a group, to make his joints—especially in an incandescent system—so that these when put in the molding, lie close together. They are properly soldered and well wrapped with a moisture-absorbing tape. By and by, perhaps, having accumulated water for a long time, they get away with us, and perhaps investigation shows a first-class place for a safety device which has never been put in.

Two wires of that character, which have lain quietly in their little wooden bed for a couple of years, have advertised this peculiarity within less than half a mile of my office during the writing of this paper.

There is another form of provoke which occurs through electrolysis in an incandescent plant, which not even the safety device can control. I know of no process for preventing this, save by the use of good wire and a proper back board to the molding. I have special reasons for disliking this form of trouble, for two such cases have occurred within a fish pole's length of my superior's desk, in the City Hall, here in Chicago.

Dynamos should, I think, be placed in better selected localities. It seems almost as if fate destined the most miserable, uncomfortable, and least appropriate places for the electric light apparatus. While this continues—I hope for an improvement in the near future—is it not good policy to induce the purchaser, if possible, to permit and pay for a better foundation than is customary? If he is a reasonable person he should be made to see in the proposition an ecomony of force and an element of safety, which he cannot reasonably ignore.

I have not infrequently found a circuit in which the dynamo alone showed faulty insulation when disconnected from the line, because too near the ground.

There are many plants throughout the country in which the insulation of the plant outside the dynamo room is as nearly perfect as one could wish, while the wires in the dynamo room, naked and stapled to the woodwork, showed less than a tenth the insulation of the rest of the plant, even when disconnected from the generator.

In the resistance coils belonging to an incandescent plant there may be lurking a subtle element of danger. The coils are usually placed in a wooden frame, and may become abnormally heated by the merest accident. A correspondent has informed me of a case in which, the better to protect the safety devices, the inner surface of the door of the pocket in which these were placed was lined with sheet tin. A screw worked loose and short-circuited a heavy current through the resistance coils, and set a fire. The presence of mind of an employé prevented the burning of the house.

A piece of pine, 2x2 inches, was wrapped with asbestos paper, and a No. 12 iron wire wound round this after the manner of a resistance coil.

Sufficient current was passed through this wire to heat and maintain it red-hot for nearly half an hour. The wood was charred to the depth of nearly half an inch, giving out heavy clouds of smoke, and the smell of the burning pine pervaded the building. Yet there was no blaze, and no danger, because the smell and smoke gave abundant warning to all.

I believe it the duty of the maker to so arrange the resistance coils that they are positively safe, and that this can be done at a very trifling expense.

A trimmer, who found an opening in a circuit which he was tracing, complained to his superior that the lineman didn't turn up the ends of the wire as he should, where these enter the binding posts of the lamps. The facts developed were that the screw which holds these contacts is without any means of fastening, and all mechanics know that a screw will, unless held by a set, run back and become loose.

The result is the introduction of abnormal resistance into the circuit, and a possible arc. But if no worse results follow, there is a material loss of power.

In lamp construction there are even more glaring faults than that mentioned. Too often the conductor from the works of the lamp to the lower carbon holder is a plain underwriter's wire, or even a magnet wire, which, on the least provocation, absorbs dampness, and grounds, or at least weakens the current.

Again, the switch of the lamp, in the majority of cases, is merely a short circuit switch, which still leaves the lamp on the line; and I have repeatedly been told by dynamo and linemen that the lamp must certainly be off the line, or otherwise it would burn. No man is safe who trifles with arc lamps under such conditions, and to-day the lamp is the most dangerous as well as most treacherous part of the circuit.

One of the various companies with which I am constantly associated, has repeatedly received complaints that at a designated hour each day, a lamp somewhere on the line goes out, and refuses to pick up again until started by the trimmer. The fault seems to be one of construction. At the time mentioned, the dynamo, having been run for several hours, and become well warmed up, is changed by the engineer to another generator. The lamp, of course goes out, but remains dead. It has been suggested that the trimmer had not cleaned his lamp feed-rod until after carboning, and that therefore it stuck, because it was but but partially polished. The fault, however, is in the lamp, and it has seemed to me that a more perfect method of feed is required.

In wet, or even damp weather, there is much loss of power at every lamp. The wire may be first-class in every respect, but if the insulators and braid are cut away, a single thread will make an appreciable leak. One little thread touching the metal at the lamp contact will drop the insulation from a megohm to less than one-tenth that resistance, when it is wet, or even damp. I have repeatedly measured lines, which, when dry, showed an insulation resistance of two or three megohms to the mile, when immediately after a rain they were perfectly unsafe; yet, the only leaks we could find were at and around the lamps, or the furniture castors, which we by courtesy call insulators.

If, in the above suggestions, endorsed as they are by actual experiences, there may be food for reflection by the readers of the REVIEW, I shall feel repaid.

ELECTRICAL NOTES FROM ALABAMA AND THE SOUTH.

(From an Occasional Correspondent.)

The people of Sheffield, Florence, and Tuscumbia, Ala., are delighted with the new exchanges just completed by the Southern Bell Telephone and Telegraph Company, headquarters, Atlanta, Ga.

Sheffield is a new iron city, not yet three years old, and has about 2,500 inhabitants, but is growing rapidly. There are five furnaces which are nearly ready to start, which will employ 2,000 men, and other enterprises, such as stove works, ice factory, furniture factory, cotton compress, paint works, etc.

Sheffield exchange starts with 50 subscribers.

Florence is just across the Tennessee river and has about 3,000 inhabitants. Many new enterprises are in operation and under construction. Florence exchange starts off with 40 subscribers.

Tuscumbia has about 1,500 inhabitants, and is situated on the M. & C. R. R., two miles south of Sheffield. At present there are only ten subscribers at Tuscumbia, and they are on four circuit wires running directly into Sheffield exchange.

Trunk lines connect Florence and Sheffield, and thus the subscribers of the three towns are in ready communication with each other.

The construction work is simply first class, as is all the work of this company, especially so in the Third District, under W. J. Cole, superintendent. Large red cedar poles were used. The construction work has been done immediately under C. T. Claberne, foreman of construction for this company, and these exchanges will long remain as a monument to his ability. Mr. Claberne is a jovial "son of Erin" and is a large, fine looking fellow, and does much towards securing new subscribers while he is constructing the exchanges.

Geo. A. Langworthy, recently an inspector at Atlanta, has been appointed manager of the two exchanges, and will no doubt fill the position with honor to himself and credit to the company.

The canvassing was done by W. T. Gentry, manager of Atlanta, Ga., exchange, who has been in the city the past 10 days seeing to the location of the switchboards and starting of the service in a first class manner. One hundred subscribers is considered an excellent beginning for about 6,000 inhabitants, but is easily understood by any one familiar with Mr. Gentry's winning conversational powers. The magneto system is used and is giving entire satisfaction. The yellow fever epidemic at Decatur, Ala., is now over and that exchange will probably be opened very soon, but the genial face of Mr. B. B. Grant, the former manager, alas! will not be seen any more, as he was a victim to the yellow scourge and a mistaken sense of duty.

The people of this vicinity were all opposed to any tariff reduction and hence are perfectly satisfied with the recent Republican victory. Unless the Democratic party changes front on the tariff question, before another four years rolls around, this section of the country will be overwhelmingly Republican. (?)

DECATUR, ALA.—Mr. D. W. Armstrong, Manager Western Union Telegraph Company, Decatur, Ala., was taken down with the yellow fever November 13th. After having passed through the entire epidemic safely, this is very sad, and his many friends hope he may be able to pull through.

ATLANTA, GA.—T. M. Bishop, Manager of Telephone Exchange, Athens, Ga., is now in Atlanta quite ill with typhoid fever. He has been sick about one month, and his relatives and friends fear his strength is too much exhausted to enable him to rally. Mr. Bishop is a native of Richmond, Va., and has been in the telephone business eight years working at Richmond, Va., Raleigh, N. C., Charleston, S. C., Birmingham, Ala., and Atlanta and Athens, Ga.

ATHENS, GA.—Mr. Henry C. Conway is now in charge of the Telephone Exchange here, in place of Mr. Bishop, who is in Atlanta very ill with typhoid fever.

MEMPHIS, TENN.—Mr. W. T. Gentry, Manager of Atlanta, Ga., Telephone Exchange, was taking in the sights of Memphis to-day. He expressed himself as much pleased with the city and the Telephone Exchange.

MACON, GA.—Mr. J. E. Dozier, formerly chief inspector here, but now connected with Atlanta Exchange, was shaking hands with his old friends, and taking in the State fair this week.

ATLANTA, GA.—Jas. A. Wolton, formerly electrician for the exchange here, but now chemist for the U. S. agricultural station at Athens, Ga., was in the city this week. He says Atlanta will eventually be his home. B. F. Dillon, superintendent W. U. Tel. Co., and manager Telephone Exchange, Jacksonville, Fla., was in Atlanta last week. He has entirely recovered from the yellow fever. He returned to Jacksonville to resume his duties there. The work of Mr. Dillon during this year's epidemic will go down to history. He is a noble character.

G. O.

The difficulty between the telephone management and the electric light company in Malden, caused by the demand of the former that the electric wires be removed from the telephone poles, was partially solved Thursday by a compromise.

Among those participating at the jubilee banquet of the Home Market Club, Boston, were H. G. Cheney and N. T. Pulsifer, of the Mather Electric Company, Manchester, Ct., two very popular and well-informed gentlemen.

On Thanksgiving day, 1877, the first telephone line in the city of Waterbury, Ct., was put up, leading from the residence of L. S. White, on Buckingham street, to that of Geo. E. Terry on Cooke street, and from thence to H. F. Bassett's, and was in successful operation on the evening of that day. This line was in successful operation during the next winter and spring. The instruments used were the same as the Bell telephone now in use, only of home manufacture, together with others wholly unlike the Bell in construction, but, perhaps, the same in principle. Many of those instruments are in existence to-day.

TELEGRAPHIC

.... The Common Council of the city of Ashland, Wis., made a contract for a fire alarm telegraph system, to cost $2,200.

.... The government has advertised to sell the telegraph line between Fort Klamath and Bidwell, Or.

.... E. B. Chandler, representing the Gamewell Fire Alarm Telegraph Company, has made a proposition to put in a fire alarm system in Little Rock, Ark.

Telegraph Lines in Oregon.

Mr. J. A. Crouch, the Western Union's foreman of their construction and repair work, was in Portland, and was questioned by an *Oregonian* reporter as to the progress of his work and the condition of the company's lines.

"The only construction work we are now engaged upon," said Mr. Crouch, "is the erection, by a force of men under J. H. McFarland, of a line from Farmington, some forty-three miles into the Cœur d'Alene country. Material is ready, however, for forty-five miles of line between The Willows and Heppner, and fifteen miles on the Lake Shore & Eastern from Gilman out, both of which will be built this coming winter. On this end of the same line, between Spokane and Sand Point, a line will be run, for which we are now shipping thither 1,300 poles.

"Mr. S. Creighton has just returned from putting in thorough repair, for the winter, the seventy-five miles of Coos bay line between Roseburg and Empire City.

"New lines are being run, and I think by this time must be about completed, from Redding to Ashland, along the line of the Southern Pacific. These will give the company a fine service between here and San Francisco.

"The lines on Puget Sound are working satisfactorily, and are in good repair.

"We are about to start a repairing party out over the Astoria line. About all that can be said concerning this line is that it is run through about as good a route as could be chosen, and is thoroughly looked after. The only other way the line could be run would be straight across from Forest Grove, or some neighboring point, and in such a case, it would still be subject to the effects of storms, the districts through which it would pass would be in places well-nigh impassible, and the canneries along the Columbia would be left without means of telegraphic communication, which certainly ought to be accorded them.

"The company, to my mind, is doing all that can be expected of it in the matter of keeping this line in order. No line could be built, no matter how big the poles, which would not break down with the weight of falling trees and branches, and the force of heavy storms. As soon as the line is broken the men start out at once. On the 70 or 80 miles between Kalama and Astoria, we have four men placed the year round. They live from 15 to 20 miles apart. Travel over the shores is for the most part impossible, and the only means of getting from point to point is the use of a rowboat. The forests and sloughs are impassible. The men take their 'grub' with them, and camp out where night finds them. In view of all the circumstances, it seems to me that there is no just cause for complaint against the company, and I regret that the board of trade should have thought it necessary to cast any imputation upon the management. No human foresight can prevent the effect of the storms, and the men certainly get out and work as promptly as they can, repairing the broken poles and lines.

"The party which is about to start out will put in new poles where they are thought to be necessary, and will trim away and cut down those branches and trees which seem in danger of falling upon the line."

Electric railways are coming to the front conspicuously and successfully.

During the month of September last the receipts on the Harrisburg electric railway have been $3,600. During the same time the total operating expenses of the road, including all attendants, repairs, oil and waste, dynamo and motor men, salaries, insurance, and other charges of every description, we are informed, amounted to only $1,200, leaving for the month a net profit of $2,400, or over 30 per cent. on the capital stock per annum. So very well satisfied are the managers of this railway with the electrical equipment furnished them by the Sprague Company that they have ordered an additional equipment to supplement the one they now already have.

An illustrated lecture on "The Electric Motor" was given before the Electrical Society of Buffalo, by H. H. Humphreys, superintendent of the Buffalo Electric Light and Power Company. He observed that it was customary to look upon the electric motor as a recent invention, while in point of fact it existed five years before the dynamo electric machine, which was nothing more than this same motor reversed. The first motor was constructed by Barlow as long ago as 1826, and consisted of a spur wheel pivoted between the poles of a horseshoe magnet. When a current of electricity was passed from the center to the circumference of this wheel, the star wheel revolved upon its central pivot. Faraday reversed this operation when, in 1831, by mechanically driving the wheel, he succeeded in obtaining currents of electricity between contact strips resting on the pivot and upon the periphery. It was the latter discovery which ultimately led to the application of the principle to electric light and other purposes, and which, for the time being, left the motor in unnoticed obscurity.

The Julien Electric Traction Company are now running three cars on Fourth and Madison avenues. Until recently, the batteries were changed after each round trip of 12 miles. Now they are only changed after the second round trip, or 24 miles. Even then the battery requires but about three hours' charge before it is put on the car again. The company hopes very soon to make three round trips, or 36 miles with one charge. If they can accomplish this, there will be required but one charge of battery a day, thus making a great saving of time and labor. In other words, horses will be changed but once a day. All this is due to the scientific progress the Julien Company is making, more especially in the storage battery. The company has done a great deal of experimental work on the three cars now in use, and has put them to such practical tests as to be able to settle on a standard. Hereafter the standard car of the Julien Electric Traction Company will be an 18-foot body, mounted on an independent truck, with a six-foot wheel base, and (on the Fourth avenue line) a 15 horse-power motor, geared to each axle. The car will carry 144 cells in six groups of 24 each. This novel grouping is for economy; for by this means the motors will be run most of the time in series, instead of altogether in parallel, as at present. It is a remarkable fact that none of the Julien cars have yet broken down or become disabled since they were put in service.

Earnings of the Westinghouse Companies.

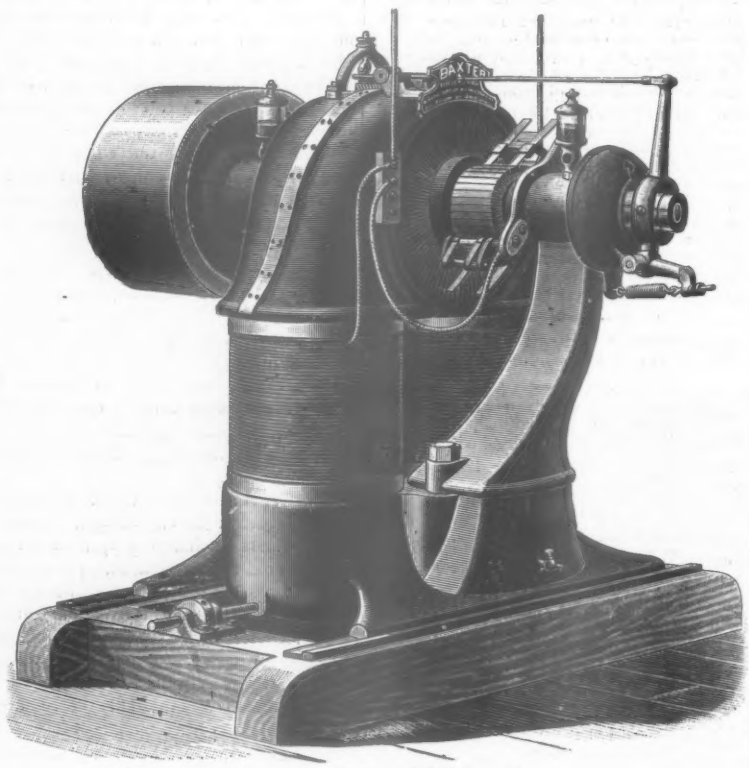
A Pittsburgh special in the N. Y. *Tribune* of November 16, contains the following: It is said that the various corporations of which George Westinghouse, Jr., is the head show gross earnings at the rate of $900,000 per month, or $10,800,000 per year. This includes the Air Brake Company, the Philadelphia Natural Gas Company, the Standard Underground Cable Company, the Union Switch and Signal Company, the Electric Engineering Company and others. Gossips have it that the private income of George Westinghouse is at present something over $800,000 per annum.

Electric Light for the Squares in Philadelphia.

A sub-committee of Councils' gas committee considered the proposition of the Siemens Lungren Company to furnish an improved lamp in place of the Siemens lamp now in many of the public squares of the city of Philadelphia. President E. Stein, of the company, stated that the new burners could be substituted for $35 per lamp, and would not only consume less gas, but would furnish a better illumination. Director Wagner was opposed to having the new lamp introduced. He said that the lamps in use at present were worn out and consumed a considerable amount of gas every night, and suggested that they be removed and electric lights be introduced. A resolution was adopted authorizing the Director of Public Safety to remove the lamps and substitute electric lights.

Large Horse-Power Electric Motor by the Baxter Company.

Owing to the necessity which is making itself felt all over the country for the manufacture of electric motors of a size and capacity very much larger than those heretofore employed, the Baxter Motor Company is about to begin the construction of a class of motors which will be uniform in general appearance with the generators which have just been placed upon the market by this company.



View of New Baxter Motor.

As will be seen from the accompanying cut, the design of the motor is identical with that of the 150 horse-power generator which has previously been shown. The field magnets are upright, circular in section and are constructed of the softest charcoal iron. The yoke is large and heavy, and forms a very appropriate foundation for the motor. By making the magnets short it has been possible to bring the armature bearings down low, so that they are not very far removed from the base. Thus are secured solidity and freedom from injurious vibrations. The same end may, indeed, be reached by inverting the magnets, but when this is done, it is found that the leakage of magnetism across the bed plate, even though this be made of zinc, becomes excessive and may lower the efficiency of the machine several per cent.

Attached to the end of the shaft is seen the bell-shaped governor protector, within which revolves the centrifugal governor, a device which regulates the current supplied to the motor when these are built for constant current circuits.

The large motors have not made their appearance too soon; they are already demanded for many kinds of work for which steam engines are generally used, and if present indications correctly foreshadow the future, it will, in a very few years, be just as common to see a 50 horse-power motor as it is to-day to see a motor of a single horse-power.

New Electric Railway Work.

The progress that the Thomson-Houston Company is making in the direction of the equipment of new electric roads is shown by the following brief summary of the new business which the company is doing:

The electric railway between Omaha and Council Bluffs has been opened for the general passenger traffic, and is now operating both to the satisfaction of the owners and the admiration of the general public. The road is nine miles in length and at present is operating sixteen motor cars and sixteen cars without motors—each motor car towing one of the others. The cars are operated in a manner quite unusual on street railways. They are made by the Pullman Palace Car Company, and are connected by the vestibule device, in use for the first time on a street railway cars; they are very popular, and it is fully believed that ere long this method will come into more general use. Although the motors work equally well in either direction, a loop is made at each end of the track so as to permit the motor car to always run ahead. This road opens a new means of rapid transit between Omaha and Council Bluffs, which is highly appreciated by the residents of the two cities, they having been previously compelled to travel by special trains on the Union Pacific Railroad, which ran once an hour and upon which twenty-five cents was charged. The fares upon the new line have been reduced to the usual street railway rates; but a speed equivalent to that of the steam road is made over a large portion of the track lying between Council Bluffs and the bridge over the Missouri River. Great credit is due to Mr. T. J. Evans and his associates in carrying through this entire project of rapid transit between the cities; they having expended not less than half a million dollars in constructing a magnificent bridge 3,000 feet in length over the Missouri River. No expense has been spared in making the railway one of the finest electric railways in the world. Mr. Evans' original idea of arranging his cars is one which will eventually find favor upon many lines, as the carrying capacity is greatly increased over the ordinary cars. While this difference over the usual equipment strikes the visitor immediately there are still many other features of the electrical construction and equipment that strikes him forcibly as he progresses with his investigation. The neatness and simplicity of the overhead construction is considered very superior work, while the operation of the cars without noise is a matter which the believers of electrical power scarcely believed could be accomplished until they witnessed the smooth running of the Thomson-Houston cars upon this line.

Within the past few days the new Thomson-Houston railway has been put in operation at Wichita, Kansas, and is working more successfully than anyone in Wichita believed was possible for an electrical equipment to do. The residents have become converted to the opinion that electricity is the power for the operation of street railways. The cars are crowded with passengers who ride apparently for pleasure, and the receipts of the road are much larger than its most sanguine projectors dreamed of. The overhead construction is one of the most striking features, and is actually considered more of an ornament than otherwise, while the noise which it was feared would be made by the running of the electrical cars is found not to exist.

The electrical equipment of a portion of the Lynn & Boston road, running through the most thickly settled part of Lynn, which has been furnished by the Thomson-Houston Company, will be put in operation during the coming week. The overhead construction on its line is the admiration of all that have seen it. In the construction of this road many different problems were met with, and successfully worked out. The road has many curves, and grades as high as 12 per cent., making the construction work exceedingly difficult; yet all who have seen it, speak nothing but praise for the successful manner in which the Thomson-Houston Company has done the work. The directors of the road had every confidence in the company when they made their contract, and a glance at the work in Lynn fully confirms the fact that this confidence was not misplaced

The Derby Horse Railway company, Ansonia, Conn., operating with the Van Depoele electric system, is about to increase its equipment by the addition of considerable Thomson-Houston apparatus.

At Syracuse, N. Y., the Third Ward Street Railway Company (Thomson-Houston system) is to be started during the present month. The equipment and overhead construction are very fine, and railway men of central New York are looking anxiously forward to see it put in operation.

The electrical equipment furnished by the Thomson-Houston Company for the Broad Gauge Street Railway Company, Des Moines, Iowa, is almost ready to be put in operation. Manager Teachout is exceedingly pleased with the apparatus furnished him, and the thorough manner in which the construction work has been done by the experts of the Thomson-Houston Company.

At Topeka, Kan., work is progressing rapidly on the installation of the Thomson-Houston plant to operate the Rapid Transit Railway under the Thomson-Houston system. This road, when put in operation, will be the largest electrical railway in the world, being 14 miles in length.

Arrangements are being made to rush the construction and equipment of the new Thomson-Houston electric railway at Alliance, O., and it is proposed to have the line in operation within a few weeks.

The electrical equipment of the Hoosac Valley Street Railway, North Adams, Mass., under the Thomson-Houston system, which it has been intending to defer until next year, will now probably be completed this season.

The Thomson-Houston electrical equipment of the Danville (Va.) Car Company's road was completed, and the cars put in operation November 15th. The road is operating with great success, and the officials are very much pleased with the perfection of the electrical apparatus.

The Thomson-Houston Company have recently placed in operation three trucks on the Scranton (Penn.) Suburban road; three on the Scranton Nay-Aug road, in addition to the complete equipment of the Scranton Passenger Railway. These trucks are working with great success, and elicit the highest encomiums from the officials of the road.

The Bangor (Me.) Street Railway Company is being equipped with the Thomson-Houston system. This road is two and one-half miles in length, and will operate two cars. The generator is on the ground, and the construction work is nearly completed, so that it is but a matter of a few days before the cars will be in operation.

At Louisville, Ky., the Central Passenger Railway Company have concluded to adopt the Thomson-Houston System, and have contracted with that company for the equipment of their road. The contract calls for 40 cars, 10 of which are to be furnished immediately.

The Electric Club.

AN INTERESTING LECTURE ON "PECULIAR MOTIONS OF LIGHTNING," DELIVERED BY DR. M. G. PARKER, OF LOWELL, MASS.—REPORT OF THE DISCUSSION.

The regular monthly meeting of the Electric Club was held November 15th, and notwithstanding the very disagreeable evening there was a good attendance. In the matter of changing the Constitution and By-Laws of the Club, it was voted to postpone decision for one month.

When President Davis called the meeting to order, among the gentlemen in attendance were A. R. Foote, of Cincinnati; J. H. Reid, of Chicago; C. J. H. Woodbury, of Boston, and E. M. Hamilton, Dr. Otto A. Moses, Dr. Geo. H. Benjamin, M. R. Schuyler, A. V. Garratt, Eugene T. Lynch, Jr., Capt. E. L. Zalinski, U.S.A., Lieut. Andrews, U.S.A., Lieut. F. W. Toppan, U.S.N., Capt. W. L. Candee, S. S. Wheeler, Henry A. Reed, E. E. Bartlett, J. Furgeson, Willis Fowler, H. C. Adams, C. W. Spear, Geo. B. Coggeshall, Cyrus O. Baker, Jr., Dr. J. Mount Bleyer, E. J. S. Van Houten, I. H. Davis, E. F. Peck, and many others.

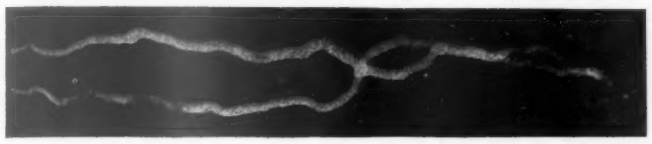


FIG. 1.—PHOTOGRAPHIC VIEW OF ROTARY MOTION FROM A SPARK OF A HOLTZ MACHINE.

The lecturer, Moses Greeley Parker, M.D., of Lowell, Mass., delivered the following address:

Photographing lightning and making good pictures, representing the forked and irregular light as it shoots across the sky, or from cloud to earth, has become quite common, and is easily done in a dark night; having first focused the lens for distant objects, one has only to point it in the direction he expects the flash to appear, expose the plate, and wait for the lightning. If the night is dark, one can obtain several flashes of lightning on the same plate, as they often occur near together. The only difficulty is to have the flash come within the field of the lens.

Photographing the current itself so as to get detail in the track, showing how the electrical currents travel, is quite another thing; this we have been able to do, and present some results, as seen in Figures 1, 2, 3, 4, and 5.

From these we see that the electrical current may travel without dividing; or it may divide and sub-divide, twist and meander in its passage from cloud to earth, its image on the negative presenting such a variety in form, that many names have been given descriptive of its general appearance, without any reference to the real motion of the current itself.

Three of these motions I have observed, viz: The twisted, the curled, and the straight-forward; being unable to find anything descriptive of this in print, a short account may not be uninteresting.

FIG. 2.—VIEW OF CURLED MOTION IN RIBBON LIGHTNING.

The twisted motion, as seen in Figures 1, 3, 4, and 5, resembles a loosely twisted rope; it twists both ways, usually from left to right, as the twining vine winds around its support; there are exceptions to this rule in the electrical, as well as the vegetable kingdom, for we find it twisting not only both ways (*i. e.*, from left to right and right to left), but it reverses its motion in the same course.

The curled motion seen in Fig. 2 resembles a twisted ribbon or shaving as it curls from the carpenter's plane, and in some respects is most remarkable.

The straight presents straight lines in its track, and is evidently travelling with great force.

Before describing the figures, or saying more about these currents, it may be well to quote the report of the committee of the Royal Meteorological Society, London, England, on lightning. The report published this year is as follows:

"1. Stream lightning, or a plain, broad, rather smooth streak of light. Only two or three specimens of this form have been received. The committee are disposed to consider this a distinct type of a single stream-like character without distinct irregularities or branches, and not merely the result of bad focusing, because other objects, such as trees, are extremely sharp.

"2. Sinuous lightning, when the flash keeps in some one general direction, but the line is sinuous, bending from side to side in a very irregular manner. This is by far the commonest type. It is very noticeable that the thickness of the line varies during the course of discharge. Sometimes the thinnest part of the white streak is the highest and the flash appears to get thicker as it approaches the earth; at other times a flash in the air begins thin, broadens out in the middle, and fines away again at the farther extremity. The committee can offer no explanation of this at present, but they would call attention to the fact that in some photographs of electric sparks, taken from an induction coil, those of high tension are thinner than those of low tension.

"3. Ramified lightning, in which a part of the flash appears to branch off from the main streak, like the fibres from the root of a tree. Of course there is no evidence as to whether these fibres branch off from, or run into, the main flash.

"4. Meandering lightning. Sometimes the flash appears to meander about in the air without any definite course, and forms small, irregular loops. The thickness of the same flash may vary considerable in different parts of the course, as mentioned above, and a flash may go pretty straight in one portion of its path, but meander considerably in another.

"5. Beaded or chapleted lightning. Sometimes a series of bright beads appear in the general white streaks of lightning on the photographic plate. Occasionally these brighter spots appear to coincide with beads in a meandering type, but often the beads appear without any evident looping of the flash. But as a flash is moving in space, while two directions only can be shown on the plane of the paper, there is every reason to believe that the brighter spots on the positive picture may be points where the flash was zigzagging, either directly toward or away from the observer, and thereby giving a somewhat longer exposure to those spots.

"6. Ribbon lightning. Nearly one-sixth of the photographs received by the society show flashes exhibiting more or less of a ribbon-like form. One edge of the ribbon is usually much whiter and firmer than the other. Occasionally in the same picture some flashes appear normal and others ribboned; but the flashes in a picture need not have occurred simultaneously. The committee have not yet in their possession any conclusive evidence as to whether the same flash may be normal in one portion and ribboned in another portion of its course. In one picture there is a bright streak on the top of the flash; then about an eighth of an inch of ribbon-like light, the folds following the sinuosities of the bright streak; then a dark band parallel to and following every irregularity of the bright streak, and then nearly another eight of an inch of ribbon like light. In another picture a very thin beaded flash has a precisely similar beaded streak, rather fainter than itself, running parallel to it at a distance of about a sixteenth of an inch on the paper. It might be suggested that the second fainter image was formed by internal reflection from the back surface of the glass plate; but it should be noticed that sometimes very thin flashes, which are not particularly bright, are so duplicated. A far more probable cause is the double image formed by the internal reflections of doublet photographic lenses. All doublets are essentially two meniscus

(*Continued on Page 10.*)

FIG. 3.—PHOTOGRAPHIC VIEW OF LIGHTNING FLASH, SHOWING ROTARY MOTION IN SINUOUS, RAMIFIED, MEANDERING AND BEADED LIGHTNING.

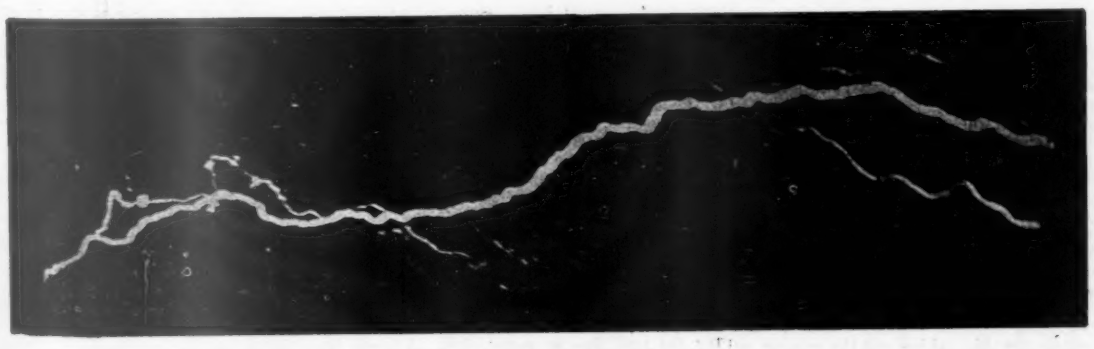


FIG. 4.—ENLARGEMENT OF FIG. 3.

ELECTRIC LIGHT NEWS

—— The Fairbanks Scale Company, of St. Johnsbury, Vt., are experimenting with oil as a fuel, instead of coal.

—— The Electric Company's building, 50x100 feet, is being built at Eau Claire, Wis. The structure will be of brick.

—— At Natchez, Miss., the Citizen's Electric Light Company will add to their machinery with a capacity of 1,500 incandescent lights.

—— The Waupaca, Wis., Electric Light Association will rebuild the dam that was wrecked some time ago. The cost will be somewhat over $5,000.

—— The Thomson-Houston Electric Company is working to introduce its electrical cars into Biddeford and Saco, Me., through the horse-railroad companies of those cities.

—— At Centreville, Md., M. F. Johnson, representing the Edison Electric Light Company, is making efforts to organize a local company, to erect an electric light plant.

—— An Edison incandescent electric lighting system, with a capacity of 600 lights, is to be established at Dubois, Pa. W. A. Stearn, of Stearn & Silverman, Pittsburgh, Pa., is interested.

—— The Danbury, Ct., Electric Light Company, having recently advanced the charge for lights, 30 merchants have promptly signed an agreement to have the lights taken out of their stores unless the old rate is restored.

—— With gas at $4 per 1,000 feet, Council Bluffs (Iowa), can certainly hold her position as a "way up" town. The desire for cheaper gas has not unfrequently been voiced, and, compared with other cities, the rate charged is high, and the Bluffites are kicking.

—— The Westinghouse Company, Norridgewock, Me., E. C. Russell, agent, has commenced the work of setting poles to introduce the electric light into Norridgewock. It is to be the incandescent system, to be put into buildings principally, the current to be brought from Skowhegan.

—— There is war in Baltimore between some of the citizens and the electric light company over the vexed question of poles. Mayor Latrobe has upon the petition of a number of merchants instructed the city solicitor to sue out an injunction asking the court to restrain the company from erecting any more poles upon the streets.

—— The Edison Light and Power Company, of Minneapolis, Minn., claims that the council by its recent action has virtually pigeon-holed the ordinance giving them the right to lay an underground conduit for their wires. In the district between Washington avenue, Fifth street, Nicollet avenue and Hennepin, the company can proceed under the general ordinance, but outside of this it can do nothing. Its representatives claim that the action was procured to force them into the Dorsett conduit.

—— MAHANOY CITY, PA., November 10. The electric light station at this place was totally destroyed by fire to-night. The fire-alarm, which was located at the electric light station, was sounded, but as it did not signal the ward the fire department did not know which way to go and lost valuable time in getting to the scene. When they did arrive the flames were beyond control and the building burned to the ground.

The dynamos and the engines are ruined and the loss will amount to $15,000 or $20,000, partially covered by insurance. The streets are in darkness and business houses have fallen back on the gas company for illumination. The origin of the fire is unknown.

THE ELECTRIC CLUB.

(*Continued from page 9.*)

lenses, mounted with their concave surfaces facing one another. The greater portion of a strong point of light, passing through both lenses, forms the usual image on the plate, but a smaller portion is reflected from the concave surface of the front lens, and from thence back through the rear lens to the sensitive plate. The amount of displacement depends on the angle formed between the direction of the bright point and the optical axis of the lens.

"M. C. Moussette, of Paris, showed some photographs of the sun, in which this double reflection image was very conspicuous; and there is not the slightest doubt that some lightning flashes are bright enough to give this secondary image. M. Moussette also showed the photograph of a flash in which the center of the flash was the whitest, with a darker edge on either side. This may have been produced either by a double reflection from the lens, or by internal reflection from the back of the glass plate. Two bands of light—the primary and secondary images—slightly overlapping would form an extra bright band where the overlap took place.

"In the majority of cases, the folds of the ribbon formation are most obvious when the course of the flash is square to the width of the folds, and they are but slightly pronounced when in a line with them. This would suggest the idea of a shaking of the camera in the direction of the folds of the ribbon; but, if this is so, the duration of a lightning flash must be much longer than is supposed. The committee hope to have the opportunity of making some experiments on the photography of sparks from a coil or electrical influence machine. In the mean time, they defer expressing an opinion as to whether lightning ever really takes a ribbon-like form till further evidence is available, but would point out that both sources of error - the duplication of the image either by reflection inside the lens or by reflection from the back of the plate—would be avoided by the use of single lenses, and of paper, instead of glass, supported films. The committee also forbear for the present from publishing a reproduction of a ribbon-like flash till they are satisfied that such a form of lightning really exists, and that the whole appearance is not due to photographic causes."

Some two years ago, while experimenting with electricity, I obtained a photograph, showing the dividing and twisting rotary motion of the electrical current, as seen in Fig. 1. My plate was not quite in focus, but the image is sufficiently sharp to show that the current divides and rotates, not only on itself, but upon its fellow.

Knowing as we do now, that the current has a rotary motion, we can see in the main track, indications of this motion, that would be impossible for any jarring of the camera to produce. Further investigation disclosed the three motions before mentioned, to illustrate which, I have, by permission of A. H. Binden, taken Figs. 3 and 5 from his remarkable photographs of many flashes of lightning, about which, it was truly said in the Boston *Herald* of July 29th, 1888: "Mr. Binden has been singularly fortunate in securing, with his two plates, photographic reproductions of all the typical forms of lightning flashes mentioned in the committees report."

The lightning flash examined as a whole, is seen to leave the cloud and reach the earth in an irregular, twisting, rotary manner, throwing off branches as it goes; these also twisting, rotating, and sub-dividing into the sinuous, ramified, meandering, beaded or chapleted, and ribbon lightning, mentioned in the Royal Society's report, while the main current, rotating as it goes, finally enters the earth in a divided form, as seen in Figs. 3, 4, and 5, which plainly shows this twisting rotary motion in the main current as well as in its branches.

Stream lightning is well described by its name alone; in this form I find what I have called the straight-forward motion; its photographs show almost straight lines without the curves indicating the rotary motion.

Sinuous, ramified, and meandering lightning, Figs. 3, 4, and 5, are all very much alike, if we grant that which we can hardly doubt, viz: that they all may divide and sub-divide as they advance. In all of these we find a rotary motion with a direction either from left to right, or right to left; in some branches both motions are found, and when well defined, resembles the twist of a rope.

Beaded lightning, seen in the centre of Fig. 3, and end of Fig. 4, has that about it that is much more interesting from a speculative point, than either of the others. The explanation given in the Royal Meteorological Society's report of the beaded form hardly explains all that we find in and on both sides of this bead; for we see the rotary motion of this current before entering the bead, to be in one direction, and immediately after leaving the bead, to be in the opposite direction, plainly indicating that the motion sometimes changes in the bead.

Ribbon lightning, as seen in Fig. 2, has what I have designated the curled motion; in this, one sees the resemblance to a curled ribbon; this current is evidently flat, with a motion that forms this ribbon into a curl, as seen at the end of Fig. 2; it somewhat resembles the beaded form, inasmuch as it is seen to change its direction, thus forming curls twisted in opposite directions and united, not by a bead, as in the beaded lightning, but by a white edge where the process of reversing its motion goes on, as seen near the centre of Fig. 2, while near the end of Fig. 2 it presents the appearance of a curl pulled sidewise, being thin and narrow; afterwards proceeding in a more regular manner than before. No possible shaking of the camera could produce this curled appearance.

That currents of electricity are influenced by the medium through or upon which they travel, is seen in Figs. 3, 4 and 5, and to the well known theory that the resistance of the air changes its direction, may be added, that the current changes in size and contracts in volume as it enters the earth, as seen in Fig. 3.

If we compare the size of these currents with the trees or other known objects, seen in the same photograph, taking into consideration the distance each are from the lens, one must, by comparison, judge the size of large currents to be, while passing through the air, *several feet* in diameter; distance must always be considered in judging the size, for as the current goes from the lens its image on the negative gets smaller, and larger as it approaches it.

Sparks from an induction coil or Holtz and other machines, give the same indications of the three motions found in the lightning; they are easily photographed; the variety is not so great as in lightning, but one has an opportunity here of varying the current in many ways.

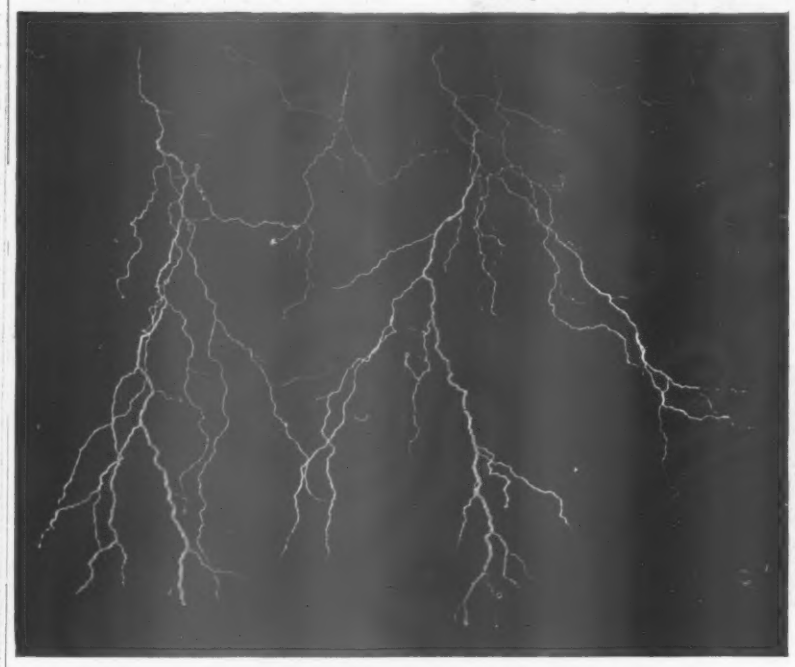


FIG. 5—PHOTOGRAPHIC VIEW OF RAMIFIED AND MEANDERING LIGHTNING, WITH LOOPS AND ROTARY MOTION.

The three motions, the reversing of the rotary motion in the continuous track of a spark, as well as the bead, are found in these currents as in lightning, and adds proof that these currents and lightning are similar.

With one observation more, I close this paper; no doubt many have noticed what I am about to mention, but its frequency last summer attracted my attention. While travelling in Maine last August, I noticed that many of the telegraph and telephone poles, which were of the native white cedar, twisted as this tree always grows, had been struck by lightning and that the current, travelling from the top of the pole to the ground, always followed the twist in the wood, often taking a groove out of the wood from top to bottom, winding once or twice around the pole following the grain of the wood.

Whenever it struck a pine pole or tree, these being straight without twists, it ran down on one side, taking out the groove or tearing the bark down on one side only.

(A large number of interesting views of flashes of lightning and a few of artificial discharges of induced electricity were illustrated by means of the stereopticon and fully described by the lecturer.)

A vote of thanks was tendered Dr. Parker for his interesting lecture, and then it was discussed by a number of gentlemen present.

Mr. M. R. Schuyler inquired what caused the difference in the width of the lightning (as shown on the screen), in the upper portion and where it entered the ground. The lecturer said he thought it was due to the fact that the end nearer the earth was nearer the camera. Dr. Parker then described the method of photographing lightning, in answer to a query of Mr. I. H. Davis.

Several gentlemen then discussed the fact that some of the flashes appeared behind and some in front of the telegraph wire shown, although the wire was much nearer the camera than was the point where the lightning entered the ground. It was estimated by the lecturer that the lightning was three-quarters of a mile away, and the wire less than one-quarter of a mile. Prof. Van der Weyde thought that the obliteration was due to the fact that the wire was out of focus, and Mr Eugene T. Lynch, Jr., and others, agreed with this. Dr. Moses thought this demonstrated in a remarkable way the dynamic action of light, and that in this case the chemical action of the light, as it were, dis-associated the particles and put them into an almost fluid condition, so that they would flow on the plate across that particular spot. Mr. A. V. Garratt didn't think that this theory of gravity could be depended upon, and asked how it could be decided whether the flashes were from the ground up or from the sky down. Dr. Parker gave it as his opinion that the diffusion of light from the stroke was sufficient in the bright flash, to blot out the wire, because it had the opportunity of diffusing itself the distance of the wire from the camera, which was something less than one-eighth of a mile. It was very singular, he thought, that where it attempted to cross in another place, there was not quite enough to entirely cut out the wire.

Mr. C. J. H. Woodbury: The disclosure of the lightning flash by these photographs, seems to me to be of interest, besides the question of meteorology (and it is undoubtedly a very valuable contribution) upon the hypothesis of the rotary method of progression of electricity along a conductor, an hypothesis which was elucidated by Clerk Maxwell—although I do not recollect whether it was original with him. Here we have a very clear representation. The speaker of the evening has referred in the ordinary manner to the stroke of lightning as being downward, and our attention has been called to the possibility of the stroke being sometimes upward. It was once my fortune to see a chimney struck by lightning. It was in July, 1880. The chimney was over 100 feet high, situated about 150 feet from a mill. During the thunderstorm a rift was taken out from the outer shell of the chimney from a point about 18 inches from the ground, and ending just below the open cap at the top of the chimney. Those bricks went upward at an angle of about 45 degrees to such a height, that in coming down they pierced the four inches of plank covering the roof like so many shot. A great amount of brick was thrown out in a line directly towards the mill. Another block of the brickwork from the same crevice was thrown at about right angles to it, in a very nearly horizontal position. It appears from that, as if the meeting of the two currents, say, the positive and negative electricity, was at a point near, or perhaps above the summit of the chimney. Another matter disclosed by these photographs, and comparable to those of animals in motion, by Senator Stanford, of California, and others, is the breaking up of some of our ideas. The day is evidently gone by when pictures of lightning should be represented in the conventional zig-zag, the pictures having disclosed their true beaded character.

Dr. Parker: I omitted to mention that there is no appearance of that remarkable zig-zag form of lightning that you see in pictures and, in fact, that you have over the front door of your Club House. You all know that Rosa Bonheur and several other painters, among them Meissonier, are very much chagrined at the fact that horses never take the position they have been painted in, as shown by photographing, and I think at the present time Messonier has re-painted the "Review of Napoleon," a picture which we have in the Metropolitan Museum here. He is very sorry that he ever represented horses in some of those positions that the photographs show they did not take. There is another thing which is a little singular if we go back farther; the Greeks have never represented any of their horses wrongly. Muyrbridge told me he had never found a picture by a Greek artist incorrectly drawn. How they did it I am unable to say.

Mr. E. M. Hamilton: I think you are going too far in regard to Muyrbridge. He says the great controversy is as to how many feet a running or trotting horse has on the ground at once. To that extent merely the Greeks have been right and many of our own artists have been right; but some of them have been very wrong.

Lieut. F. W. Toppan: I would like to know if the effects of the lightning upon the atmosphere would not be interesting at this moment. Now, there is a commonly adopted theory that thunder is produced by the lightning or the electric current passing through the atmosphere, forming a vacuum, and resulting in thunder. It has appeared to me, on more than one occasion, that thunder was the effect of the electric fluid passing through the atmosphere filled with vapor, and decomposing this vapor, the water forming hydrogen and oxygen in certain parts; as much of these parts as can, combine, and of course, result in an explosion. I would like to hear from Dr. Moses upon this particular point.

Dr. Moses: I think that is a very interesting suggestion. There is an observation in Faraday's "Experimental Researches," 1st volume, in which he says that lightning is simply the polarity of the particles brought to an infinitely high tension, and at that point something gives way. Perhaps that is due to chemical decomposition. He says that it is to be compared, either downwards or in any direction, to the passage of a current over a metallic conductor.

Dr. Parker: There is one question you have not touched upon. I hope Dr. Moses and others will give us their opinion upon the one point of repulsion, as to whether they thought the current shown at the side of one of these plates, was in the opposite direction, and whether they thought this to be an induced current or not.

Dr. Moses: It would be difficult to say, when we find, for instance, that two of those flashes have the right hand motion, and another one the left hand motion, and yet if the relation between the right to left in one of these would be the same as the other, it would be very difficult to assume it was the return flash. The conditions should be the same in both cases and then they would be all in one direction. As soon as there are four streams in one direction, and one in the reverse direction to the others, it is to be supposed it is inverted and that it is the return blow from the earth to the sky.

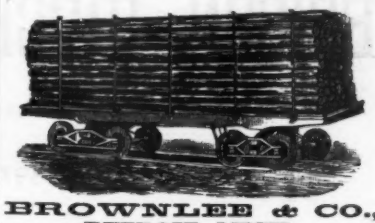
Dr. J. M. Bleyer, of the Medico-Legal Committee of New York, appointed to devise a method for executing criminals by electricity, was called on to address the Club.

Dr. Bleyer: Some three years ago I investigated that subject at the Stevens Institute. I had received a notice from the Governor of the State and from the commissioner appointed by the Governor, to help investigate the subject of capital punishment, which I did. Three years ago I handed in my report. After that a commission was appointed and they again reported. A medical society in New York, of which I am a member, formed a commission to investigate the subject. We have now adopted the method I formerly suggested, and that is, the head electrode and the spinal electrode, applying it to the top of the head in the shape of a helmet, and having the criminal in a recumbent position instead of sitting, and having a good long, flat electrode. The measurements were made and we killed a dog weighing 150 pounds, by lightning, in less than one six-thousandth of a second, without a yell. We have taken pathological specimens from the brains, nerves, etc., and found remarkable differences from specimens resulting from any other cause of death. In the brain sections we found that the blood would be coagulated, not decomposed as I thought. It seems as if it had boiled the blood instead of decomposing. This was with the alternating current. There is no difference in the alternating and continuous current. We have now got so far as to arrange the apparatus, and we are ready for the first execution. After it takes place I shall make a post mortem examination and take the pathological specimens—the brain, muscles and nerves—and shall be pleased, at that time, to give you the pictures on the screen.

ELECTRICAL PATENTS

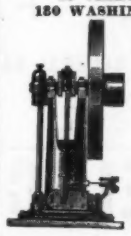
INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING NOVEMBER 13, 1888.

392,604 Combined fire alarm and telephone telegraph; George C. Hale, Albert Barrett and Joseph Zetner, Kansas City, Mo.
392,633 Elastic lamp switch; Charles G. Perkins, Hartford, Ct.
392,641 Auxiliary fire alarm box; Easor L. Slocum, Lincoln, R. I.
392,660 Insulation of cores of dynamo machines; Benson Bidwell, Chicago, Ill.
392,664 Conduit for electric railways; Henry A. Chase, Stoneham, Mass.
392,665 Electric gas lighter; Henry A. Cleverly, Philadelphia, Pa.
392,666 Incandescent lamp socket; Theophilus Coad, Forest Gate, County of Essex, England.
392,675 Electric railway; Rudolph M. Hunter, Philadelphia, Pa.
392,679 Electric speed governor for water wheels; George M. Lee, Little Falls, N. Y.
392,698 Coin controlled electrical weighing scale; William R. Smith, Bandera, Texas, and Albert L. Washburn, New York, N. Y.; said Washburn assignor to said Smith.
392,701 Electric machine for lighting and extinguishing gas; George E. Thaxter, Boston, Mass.
392,724 Electrical circuit and apparatus guard; Isaiah H. Farnham, Malden, assignor to the New England Telephone and Telegraph Company, Boston, Mass.
392,736 Electrical apparatus for the prevention of incrustation; Maxymilian Kotyra, Cardiff, County of Glamorgan, England, assignor to Christopher Bulman and Arthur Benson Fiffen, same place.
392,757 Overhead conductor for electric railways; Elias E. Ries, Baltimore, Md., assignor, by direct and mesne assignments, to Ries and Henderson, same place.
392,765 Dynamo electric machine; Elihu Thomson, Lynn, Mass.
392,766 Signaling apparatus; Wesley Trafford, New York, N. Y., assignor, by mesne assignment, to Elizabeth R. Trafford, same place.
392,772 Electrical railway; Owen Allen, Denver, Col.
392,775 Electric circuit; John A. Barrett, Brooklyn, N. Y., assignor to the American Telephone and Telegraph Company, of New York.
392,826 Automatic switch for secondary batteries; John S. Sellon, Hatton Gardens, County of Middlesex, England, assignor to the Electrical Accumulator Company, of New York.
392,832 Individual signaling apparatus; Charles N. Talbot, New York, N. Y.
392,838 Message and time recorder; John C. Wilson, Boston, Mass.
392,843 Telephone support; Sigmund Bergmann, New York, N. Y., assignor to the American Bell Telephone Company, of Massachusetts.
392,855 Automatic governor for dynamos; Edward B. Coburn, Walpole, Mass.
392,863 Electric railway; Benjamin Heywood, New York, N. Y.
392,890 Regulation of electric motors; William Stanley, Jr., Great Barrington, Mass., assignor to the Westinghouse Electric Company, Pittsburgh, Pa.
392,914 Telegraphy; Stephen D. Field, Stockbridge, Mass.
392,930 Method of synchronizing electric motors; Francis J. Patten, New York, N. Y.
392,967 Synchronizing system for electric motors; Francis J. Patten, Bath, Maine, assignor to J. M. Seymour, New York, N. Y.
392,970 Annunciator; Foster Ritchie, Chicago, Ills., assignor to the Railway Telegraph Supply Company, same place.
392,971 Electric railway; Ira Robbins, Camden, N. J., assignor of one-half to William Nuneviller, Philadelphia, Pa.



BROWNLEE & CO.,
DETROIT, MICH.
DEALERS IN
CEDAR TELEGRAPH POLES.
MANUFACTURERS OF
Cross Arms, Pins and Brackets, Oak and Locust Pins, CEDAR TIES, For Electric Railways.

OTTO
GAS ENGINE WORKS
83d AND WALNUT ST., PHILADELPHIA.
18 VESEY STREET, NEW YORK.
180 WASHINGTON STREET, CHICAGO.



Sizes, 1 to 100 Horse Power.
HORIZONTAL, VERTICAL, TWIN, CYLINDER.
We will contract to furnish Incandescent or Arc Electric Light Plants, with "Otto" Engines, guaranteeing results.

O. K.

Full Size!!!
NO ONE
Denies this to be the only safe automatic in the
LAND
Perfected
Improvements
Commend it to the Trade.
$6.00 EACH.
Discount (—).
A. L. BOGART,
22 Union Sq., N. Y.

O. K.

ROYCE & MAREAN,
DEALERS IN
ELECTRICAL APPARATUS
Telegraph and Telephone Supplies,
No. 1408 Penna. Avenue,
Opp. Willard's Hotel, WASHINGTON, D. C.

WM. H. COLE,
ELECTRICAL ENGINEER,
No. 775 TENTH AVE., NEW YORK CITY.
SPECIALTIES.—Electric Lighting, Electric Rail Roads, and power plants in connection with the same. Contractor for the construction of Electrical Machinery and Appliances. Independent, Reliable, Expert Measurements, Tests and Reports made.

CONDENSERS WM. MARSHALL, MANUFACTURER. Standards a Specialty
Rooms 2 and 4, University Building, New York.

SPLICER requires engagement. 20 years experience in cable work, lead covered included.
L, 271 W. 40th Street.
NEW YORK CITY.

DIRECT READING AM-meters and Volt-meters.
(A. K. EATON'S PATENT.)

VOLT-AM-METER.
ALSO
ELECTRICAL INSTRUMENTS of all kinds
Manufactured and for sale by
A. K. EATON, 191 Fulton St., Brooklyn, New York.

SILKS. Full assortment of different sizes and qualities on BRAIDER SPOOLS, ready for the machines, in Red, Yellow and Green. Other colors to order. Send for Sample and Prices.
WM. MACFARLANE & CO., 55 Mercer Street, New York, Mill, Yonkers, N. Y.

Detroit Electrical Works
MANUFACTURERS OF
ELECTRIC SUPPLIES,
INCLUDING
Medical Batteries, Skeleton and Box Bells, Burglar Alarms, House Annunciators, Fire Alarm Boxes, Pins and Brackets.
Insulated Magnet, Telephone and Electric Light Wire.
GENERAL OFFICES and FACTORY:
DETROIT, MICH.

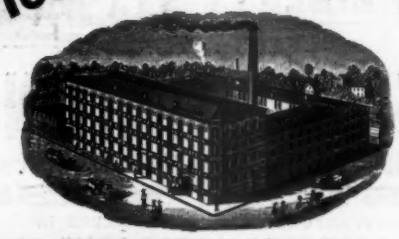
FRESH TESTIMONIALS TO THE SUPERIORITY OF
SIMPLEX WIRE.

THE VIRGINIA ELECTRIC LIGHT & POWER COMPANY, OF RICHMOND, VA.
NEW YORK OFFICE, 63 WALL STREET.
New York, August 21st, 1888.
A. F. MASON, Esq.,
SIMPLEX ELECTRICAL CO.,
Boston, Mass.
Dear Sir:
I have been using the Simplex Wire on a large portion of our lines in Richmond, Va., for the past five months. I have taken daily tests of the insulation during that time. The longest single circuit I have is about five miles, and at no time has the insulation test ever been less than one megohm. I cannot speak too highly of the wire or its insulation. A large portion of it has been run through foliage and trees in the streets, and upon examination a few days ago I failed to find any place where the wire has been abraded by coming into contract with the branches of trees. My instrument does not measure over one meghom, and I cannot tell how much higher the insulation may have measured. One megohm on wires in circuit is enough for me.
Yours very truly,
W. H. COLE, *Superintendent.*

THOMSON-HOUSTON ELECTRIC CO.,
AUGUSTA, GA.
August 12th, 1888.
Dr. A. F. MASON,
SIMPLEX ELECTRICAL COMPANY,
328 Washington St., Boston, Mass.
Dear Sir:
We are using in our arc-lighting circuits about twenty (20) miles of your Simplex T. Z. R. wire.
We have feund the insulation a most perfect protection against moisture and the abrasion of small tree limbs.
Have used your wire in our station, for running through trees, on buildings and porches, under mouldings, etc., and through cellars, and we have never been able to discover a "ground" upon any circuit since our plant was put into operation.
Very truly yours,
JOHN H. WATERMAN.

ADDRESS,
The Simplex Electrical Co.,
328 WASHINGTON STREET, BOSTON, MASS.

EUGENE F. PHILLIPS, PRESIDENT. W. H. SAWYER, SEC'Y AND ELECTRICIAN.
American Electrical Works



PROVIDENCE, R. I.
MANUFACTURERS OF PATENT FINISHED
INSULATED ELECTRIC WIRES,
TELEPHONE & INCANDESCENT CORDS.
Electric Light Wire
Magnet Wire, Patent Rubber-Covered Wire, Lead-Encased Wire, Flexible Cordage, Office and Annunciator Wire.
Underground and Aeriel Cables.
New York Office: 18 Cortlandt St.
P. C. ACKERMAN, Agent.

SCHAEFER ELECTRIC MFG. CO.
INCANDESCENT LAMPS, From 10 to 100 Candle Power.
DYNAMO MACHINES of Improved Construction.
Proposals and Estimates furnished for Complete Installations of Incandescent plants upon application to
P. O. BOX 3068, Boston, Mass.
FACTORY AT CAMBRIDGEPORT, MASS.

PATENT "K.K." LINE WIRE
For ELECTRIC LIGHTING.
Telegraph and Telephone,
MANUFACTURED BY
HOLMES, BOOTH & HAYDENS,
25 PARK PLACE, NEW YORK.
TRADE MARK "K.K."
J. L. BARCLAY, Selling Agent, THE ROOKERY, CHICAGO, ILL.
TRADE MARK "K.K."
THOMAS L. SCOVILL, NEW YORK AGENT.

NEW YORK BELTING AND PACKING CO.

WAREHOUSE: 15 PARK ROW, NEW YORK.

The Oldest and Largest Manufacturers in the United States of

VULCANIZED RUBBER

In every form adapted to mechanical purposes.

MACHINE BELTING,

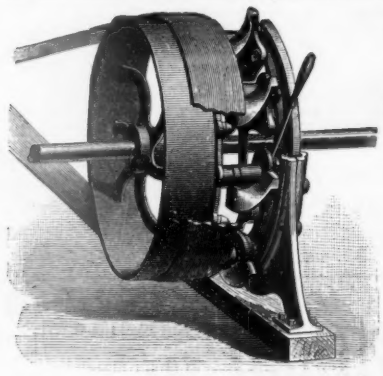
With Smooth Metallic Rubber Surface

This Company has Manufactured the Largest Belts made in the World for the principal elevators at Chicago, Buffalo and New York.

We make a Superior Quality of Belting for Electric Light purposes, for use on Dynamos and Swift running machinery.

JOHN H. CHEEVER, Treasurer.

BRANCH HOUSES AT BOSTON, PHILADELPHIA, CHICAGO, ST. LOUIS,
European Branch: Pickhuben 5, HAMBURG, (Freihafengebiet), GERMANY.



BEST AND CHEAPEST
METHOD OF
CONTROLLING BELTS.

PERFECT SUBSTITUTE FOR FRICTION CLUTCHES.

SEND FOR DESCRIPTIVE CIRCULAR.

THE **SCHENCK**
Belt Holder & Shifter Co.

MAIN OFFICE. **93 LIBERTY ST., NEW YORK.**

THE

ELECTRIC GAS LIGHTING CO.,

SALESROOMS, 35 ARCH ST. FACTORY, 173 DEVONSHIRE ST.

BOSTON, MASS.

MANUFACTURERS OF AND DEALERS IN

ELECTRIC GAS LIGHTING APPARATUS,
ELECTRIC BELLS AND ANNUNCIATORS,
TELEPHONE, TELEGRAPH & ELECTRIC LIGHT SUPPLIES
BURGLAR ALARM MATERIAL,
AND ELECTRICAL GOODS IN GENERAL.

NOTE OUR SPECIALTIES.

The "Single Magnet" Ratchet Automatic Burner, popular all along the line....The Tubular Magnet Vibrator, the most practical vibrating burner made.....An extensive line of Hand-Lighting or "Pendant" Gas-Burners, standard goods among first-class dealers and fitters throughout the country.

The "Automatic Sectional Cut-Out," for the protection of gas-lighting circuits.....The "Tirrell" Gravity Drop Annunciator, for houses and hotels, a simple and elegant instrument, made in styles A, A1, and A3....Also the "TIRRELL" BURGLAR ALARM ANNUNCIATOR, Style A2.

The "Star" Electro-Mechanical Gong, for school-houses, fire stations, railroads, factories, etc....The "VICTOR" WOODEN BOX BELL; "VICTOR IRON BACK," "HUB" IRON BOX, and "STANDARD" IRON FRAME BELLS, and "BOSS" ELECTRIC BUZZERS.

The "O. K." Push Button; IMPROVED FLOOR AND PEAR-SHAPE PUSHES; IMPROVED BURGLAR ALARM DOOR AND WINDOW SPRINGS; AUTOMATIC GAS-LIGHTING KEYS Styles A, B, C and D; and an elegant line of Door-Pushes and Pulls, etc., etc.

ALSO SOLE MANUFACTURING AGENTS FOR THE

CELEBRATED "SAMSON" (FRENCH) BATTERY,

And the "Samson" Medical Battery.

☞ This Company does no Electrical Construction or Fitting in competition with its Customers. Send for late Descriptive Circulars and Price-Lists.

"THE BEST GOODS ONLY AND AT REASONABLE PRICES."

Boston, Sept., 1888.

Sperry Electric Company,

Factory, 194 to 198 So. Clinton St., Chicago, Ill.

MANUFACTURERS OF THE

Improved Sperry High and Low Tension Systems of Arc Lighting,

Claiming the Highest Efficiency, Reliability and Durability. Perfect Regulation.

W. R. OSTRANDER & CO.
21, 23 & 25 ANN ST., NEW YORK,
Manufacturers of
SPEAKING TUBES, WHISTLES
ANNUNCIATORS,
Electric & Mechanical Bells

FACTORY,
De Kalb Avenue,
BROOKLYN.
Send for Illustrated Catalogue.

EDISON MACHINE WORKS,

Schenectady, N. Y.

MANUFACTURERS OF

INSULATED WIRES, FLEXIBLE CORDS AND CABLES,

—FOR—

Telephone, Telegraph and Electric Light.

JAMES F. KELLY.

GENERAL SALES AGENT,

19 Dey Street, New York.

ELECTRIC BELLS

Ornamental and Useful.

WOOD BOX,
IRON BOX,
IRON FRAME.

PUSH BUTTONS—BOTTOM PRICES.

The Electrical Supply Co.,

Eastern Offices & Factories, ANSONIA. CONN.

Western Office & Warehouse, 171 RANDOLPH ST., CHICAGO.

BRANCH OFFICE, 505 DELAWARE ST., KANSAS CITY, MO.

THE

Complete Electric Construction COMPANY,

Rooms 312 and 314.

18 Cortlandt St., New York.

TELEPHONE CALL, 597 JOHN.

CONTRACTORS FOR ALL KINDS OF ELECTRICAL CONSTRUCTION.

D. W. Baker. Cyrus O. Baker, Jr.

BAKER & CO.,

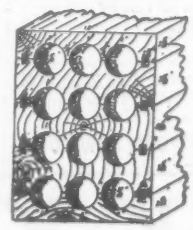
Importers, Melters and Refiners of

PLATINUM,

408, 410, 412 and 414 N. J. R.R. Ave., NEWARK, N. J.

Platinum in sheet and wire, all sizes, and any degree of hardness. Scrap and native platinum purchased

The MacDonald Subway Electrical Conduit.



PATENTED JULY 6, 1886, No. 334,843.

This Conduit is made of Creosoted Timber in 16 feet Lengths.

It is simple, **durable, easily laid, water tight,** and not **expensive.** Conduits from one-half inch to three inches.

Circulars and information furnished.

GEORGE S. VALENTINE,

(Manager Eppinger & Russell Creosoting Works,)

SOLE AGENT,

OFFICE, - - - 160 WATER STREET, N. Y.

BOOKS ON ELECTRICAL SUBJECTS

Will be mailed to any address, postage prepaid, on receipt of price. Address,
ELECTRICAL REVIEW PUB. COMPANY,
13 Park Row, New York P. O. Box. 3,329.